Coal Age

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Director of Circulation, COAL AGE,
330 West 42d St., New York 18, N. Y.

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Name .....

Old Address .....

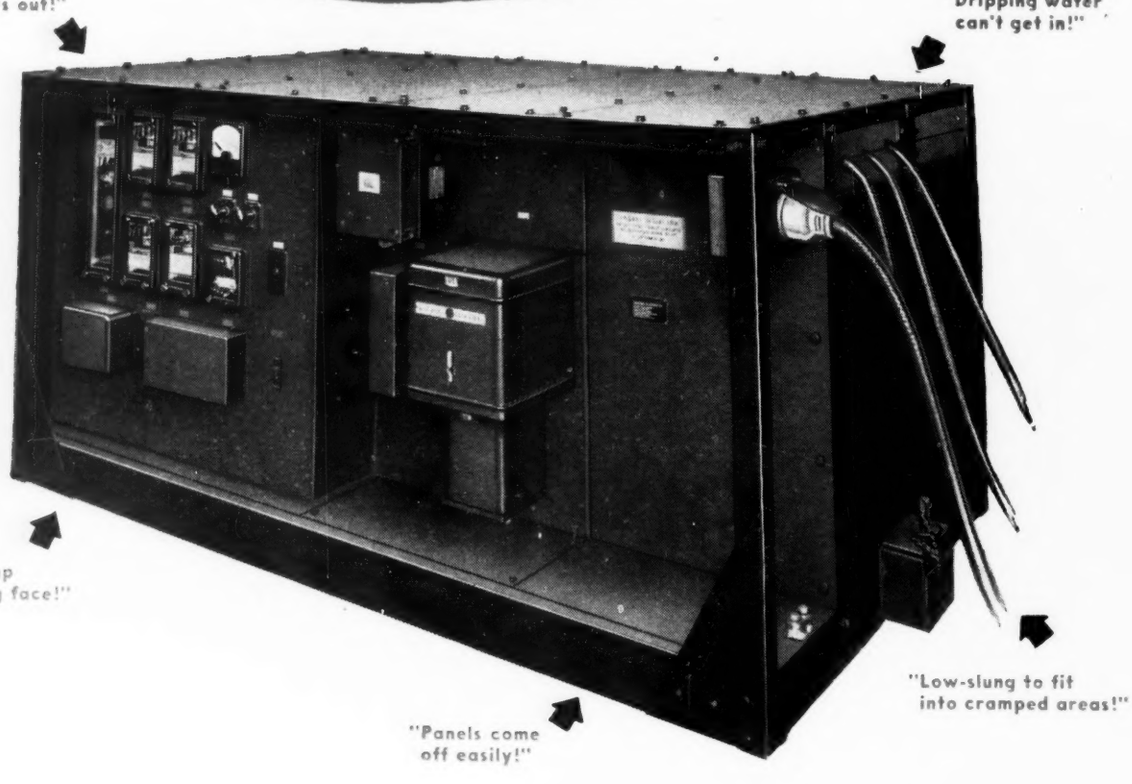
New Address .....

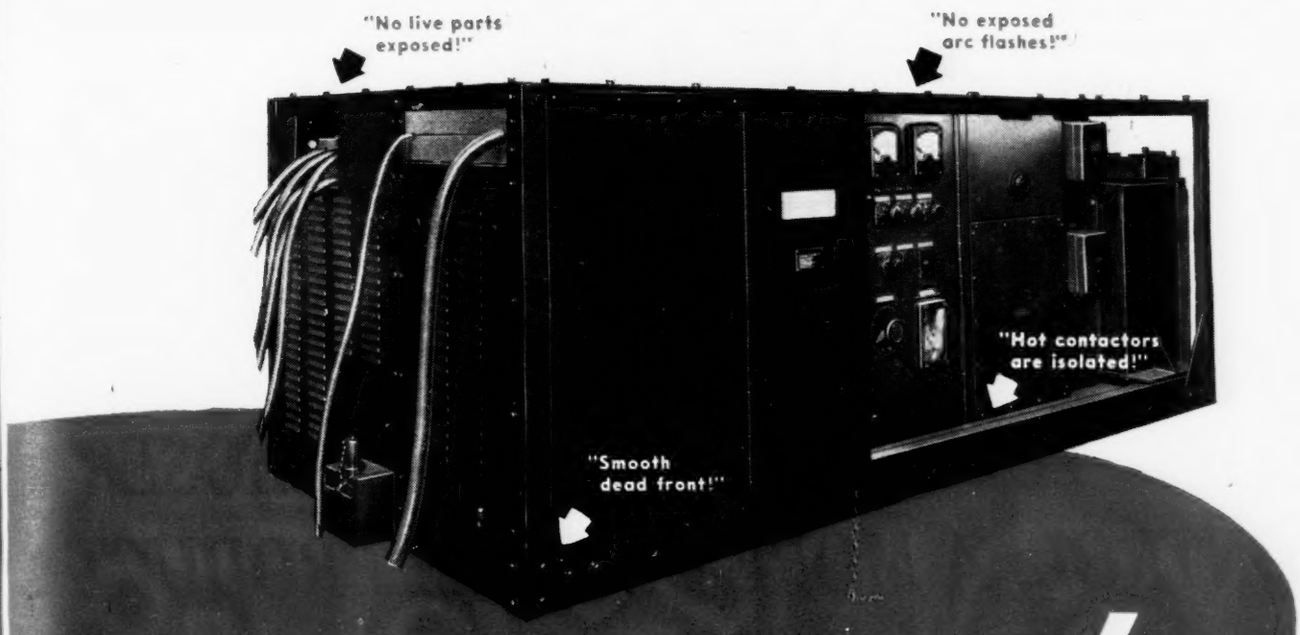
New Company Connection .....

New Title or Position .....

G.E. ANNOUNCES FIRST SAFETY-ENCLOSED PORTABLE RECTIFIER-SUBSTATION

DESIGNED TO GIVE YOU Greater Safety


"Dirt stays out!"
"Dripping water can't get in!"
"Easy to run up near working face!"
"Low-slung to fit into cramped areas!"
"Panels come off easily!"



UNDERGROUND!

Here it is—another G-E "first"—the portable rectifier substation you asked us to design. Ten years of successful mine-rectifier experience has gone into this new safety-enclosed unit. Now it's easier and safer than ever before to maintain full voltage for "all out" operation of mechanized mining equipment. This substation gives greater assurance of operating continuity. It simplifies maintenance.

Note the clean, dead-front appearance of the equipment on all sides. Even in cramped underground locations, men can't accidently touch "live" parts, nor are there any arcs visible when contactors are in operation. The equipment is also protected from adverse conditions. The sealed-ignitron mercury-arc rectifier is a "natural" for underground mining where coal dust and dirt offer a threat to rotating equipment.

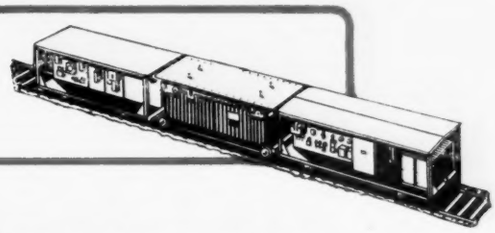
Fast, easy maintenance!

We've made these new substations particularly easy to inspect and maintain. Top panels are segmented for easy entry into any one section.

All side panels are quickly removed. Swinging doors permit easy access to frequently inspected areas. In other words, even though G-E portable substations are enclosed, your maintenance men can still get at inside controls and wiring quickly and easily.

If you have hesitated to use underground substations because of safety and maintenance problems, here's your chance to get full-voltage power and high output in a safe, easy-to-use equipment. These new portable units can take plenty of abuse and still stay on the job. Write or phone our nearest office for complete details. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

A complete G-E portable rectifier substation consists of automatic a-c switchgear, Pyranol transformer, and rectifier with d-c switchgear. Each unit is car-mounted. Portable substations allow conversion to direct current thousands of feet closer to the working face, thereby making long, low-voltage d-c feeders unnecessary, and assuring full voltage for efficient operation of cutters, loaders, and conveyors.



Portable RECTIFIER SUBSTATIONS

GENERAL ELECTRIC

657-52-148, 204

Need Capacity?

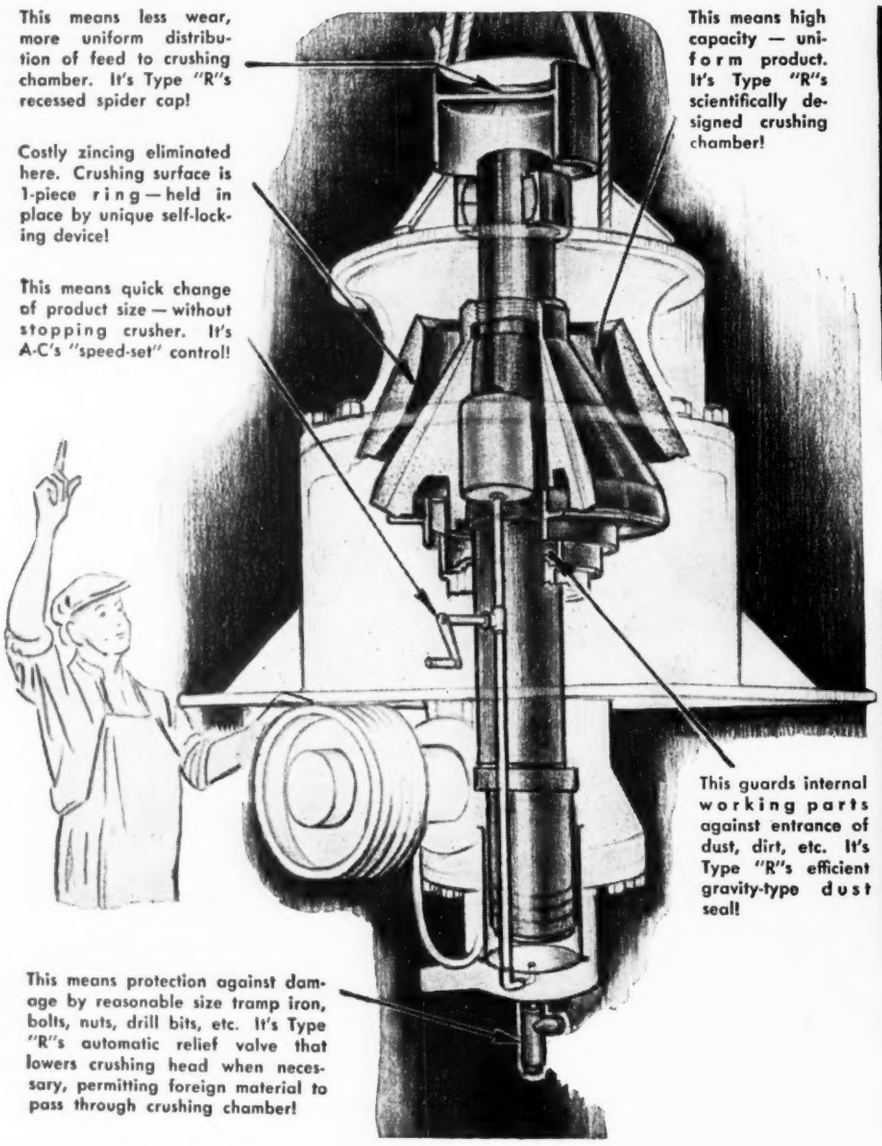
A-C'S TYPE "R" SECONDARY CRUSHER GIVES YOU HIGH CAPACITY, CLOSER CONTROL, A MORE UNIFORM PRODUCT —AT A LOWER COST PER TON!

This means less wear, more uniform distribution of feed to crushing chamber. It's Type "R"s recessed spider cap!

Costly zincing eliminated here. Crushing surface is 1-piece ring—held in place by unique self-locking device!

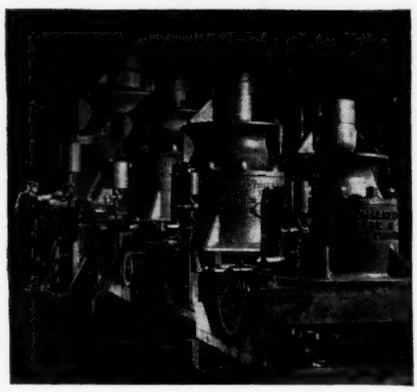
This means quick change of product size—without stopping crusher. It's A-C's "speed-set" control!

This means high capacity — uniform product. It's Type "R"s scientifically designed crushing chamber!



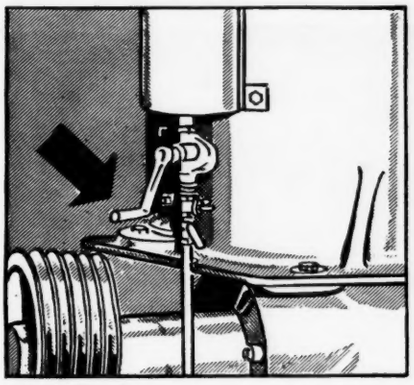
This guards internal working parts against entrance of dust, dirt, etc. It's Type "R"s efficient gravity-type dust seal!

This means protection against damage by reasonable size tramp iron, bolts, nuts, drill bits, etc. It's Type "R"s automatic relief valve that lowers crushing head when necessary, permitting foreign material to pass through crushing chamber!

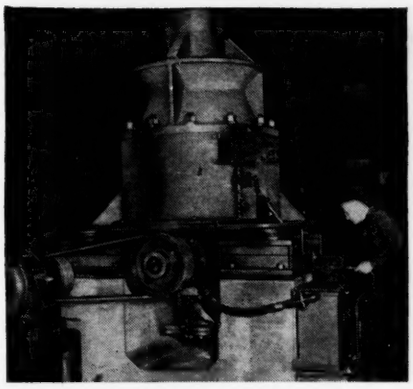


1 Want *proof?* Compare it with *any other crusher* in same price range. At a given setting, Type "R" will give you a *more uniform* product, *greater capacity* of size of product you require!

2 All wearing parts are heat-treated manganese steel. Their non-choking, uniform wear design permits close setting — enables production of fine stone or excellent ball mill feed.

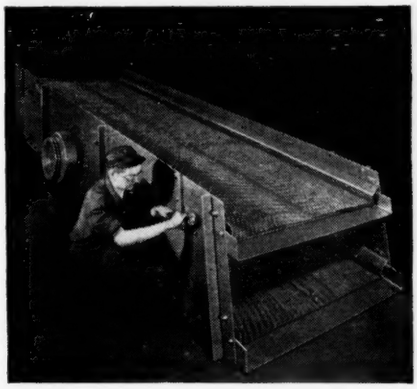


3 Exclusive A-C "speed-set" control permits *quick* change of product size — at simple, almost effortless *turn of crank*. Result: close product control, fast unloading in case of emergency!

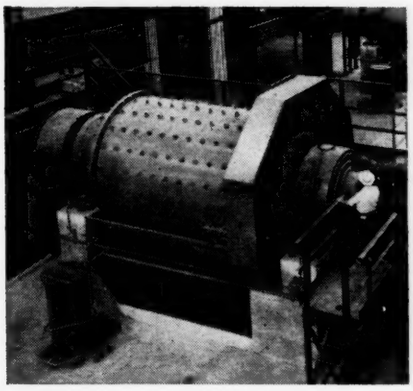


4 Before it can go out to do a job for you, every Type "R" crusher is *assembled and shop-tested* . . . checked for crusher movement; head clearances; oil circulation, temperatures, etc.

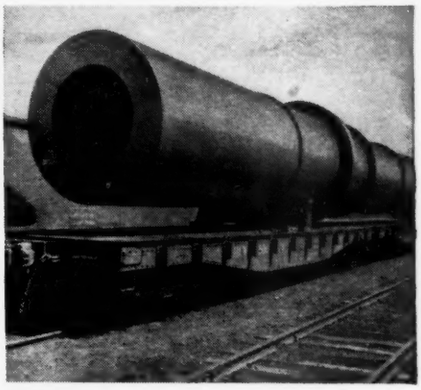
5 Best of all, you can buy easy-to-install and operate, low-maintenance, modern Type "R" crushers for *same or less money* than comparable crushers! Want more details? Send for B6006B



6 Got a screening problem? Perhaps A-C's modern "Ripl-Flo" or one of *seven other different* screens we build, can solve it! Yes, in every line A-C gives you wide choice! For example . . .



7 A-C builds *world's largest line* of single and multi-stage grinding mills—ball, rod, pebble, "compeb" and "ballpeb" types. Over 3700 mills now operating all over the world is an A-C record!



8 No, not "long tom" but an A-C rotary kiln. Products being treated in large quantities, at low cost in A-C kilns include cement, lime, ores, oxides, varied synthetic materials, etc.

A-C "TEAMS-UP" MACHINES AND POWER!

. . . builds not only basic *processing* machinery, but also the equipment to *run* it! Yes, Allis-Chalmers offers you power generation, distribution and control equipment—motors, pumps, blowers, compressors, Texrope V-belt drives—builds over 1600 *different* products for *you!*

A 1967

ALLIS-CHALMERS

PRODUCER OF THE WORLD'S LARGEST LINE OF MAJOR INDUSTRIAL EQUIPMENT!

A-C

MILWAUKEE, WISCONSIN

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*

Salute to THE COAL INDUSTRY

During 1944-45, Union Pacific paid tribute to American industry on its radio program "Your America", broadcast each week over a nation-wide network. Representatives of 70 major industries were given the opportunity to present the dramatic story of their respective industry's contribution to the welfare of the nation.

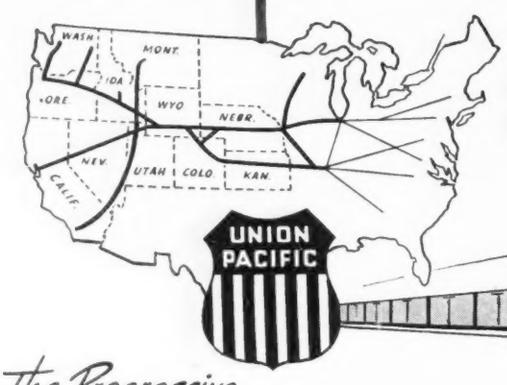
For example, on one program our guest speaker, Eugene McAuliffe of Omaha, Nebraska, represented the coal industry. On other programs were H. L. Derby of New York City, the Manufacturing Chemists' Association; and Frank Carman of Washington, D. C., the Plastics Materials Manufacturers' Association.

Union Pacific—along with other railroads—was then engaged in moving vital wartime materials. Your industry and the nation generally knows what a tremendous task that was and how efficiently it was accomplished.

Today, Union Pacific is prepared to continue its assistance to your industry by speeding the distribution of peacetime commodities. Equipment, facilities and personnel are geared to provide unexcelled service.

A staff of trained traffic men stand ready at all times to cooperate with you.

For fast, dependable service . . . .



Be Specific— say "Union Pacific"

★ *Union Pacific will, upon request, furnish information about available industrial and mercantile sites in the territory it serves. Address Union Pacific Railroad, Omaha, Nebraska.*

The Progressive

UNION PACIFIC RAILROAD

The Strategic Middle Route

MOVE MORE YARDS faster-at lower cost!

YARDAGES moved by power units at 3 miles an hour was *once* considered fast, low-cost hauling.

But today that speed is *high*-cost operation. Today those slow-moving units are obsolete—made so by modern equipment that rolls on rubber—on BIG pneumatic tires. For *BIG* tires roll easily over job-site bumps, make faster-hauling power units possible.

That's why earth-moving speeds are many times faster today. That's why today's rubber-tired equipment enables one man to fast-haul up to 15 tons and more at over 10 miles an hour, *and do so at lower costs-per-ton-mile than dirt was ever moved before!*

With gigantic postwar jobs planned the country over, earth-moving schedules will call for bigger and bigger yardages to be moved faster and faster. Your costs—and your contracts—will be determined by the speed with which you haul.

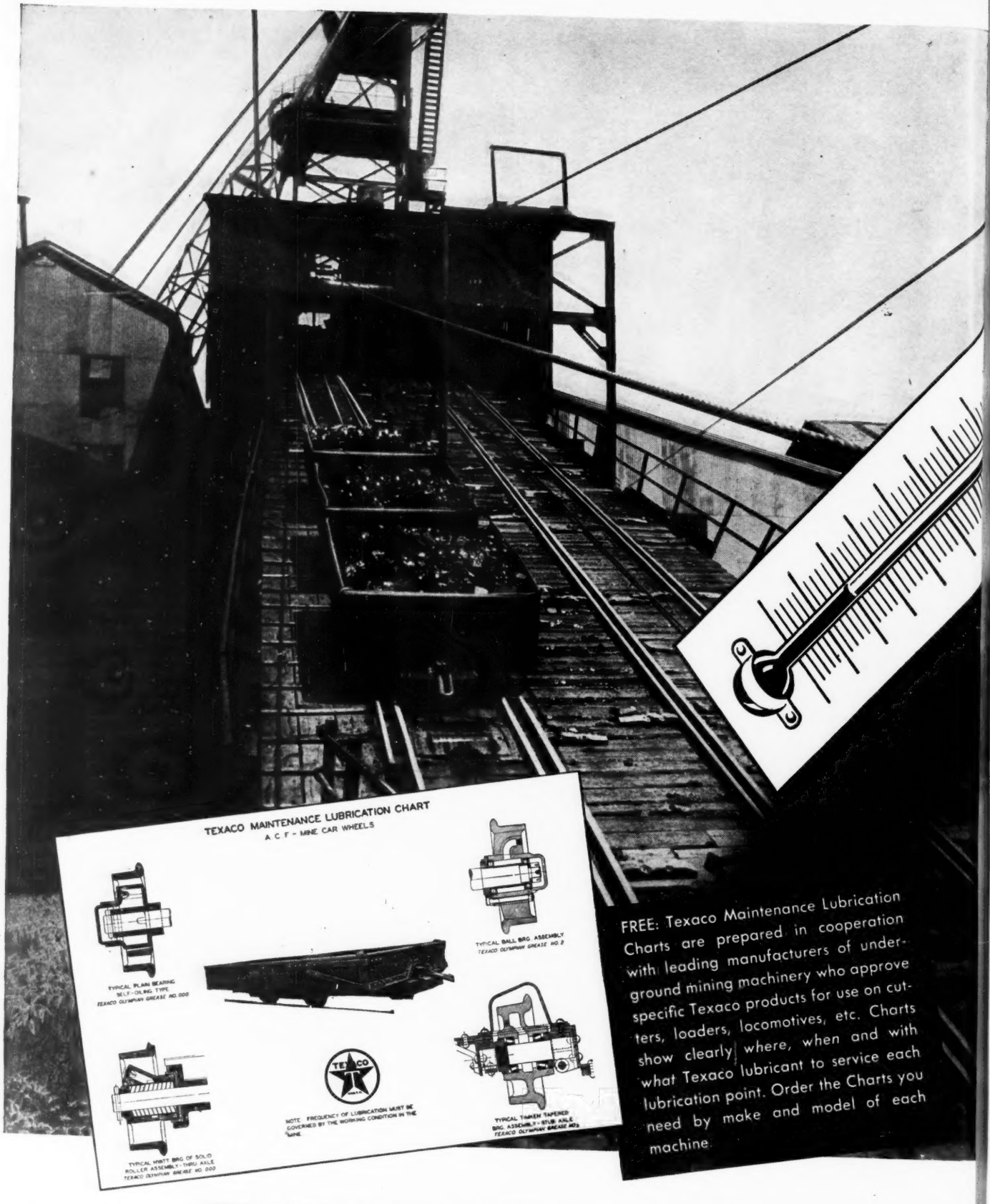
So plan now to get and hold your share of big jobs by putting your equipment on big tires. And when you're ready, choose with care—choose Goodyears. Job-proved tops in performance, Goodyear off-the-road tires come in 3 tread designs to meet all operational needs, deliver lower costs-per-ton-mile, are *first choice* with cost-wise contractors everywhere. It pays to buy—and specify—Goodyears.

Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

Caterpillar Diesel DW-10 tractor with Goodyear Sure-Grip tires pulling LaPlante-Choate Carrimor scraper on Goodyear All-Weather Earth Mover tires, moving heavy clay on airport job.

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND


TEXACO MAINTENANCE LUBRICATION CHART
A C F - MINE CAR WHEELS
TYPICAL PLAIN BEARING SELF-OILING TYPE TEXACO OLYMPIAN GREASE NO. 000
TYPICAL BALL BRG. ASSEMBLY TEXACO OLYMPIAN GREASE NO. 2
TYPICAL HYATT BRG. OF SOLID ROLLER ASSEMBLY - THRU AXLE TEXACO OLYMPIAN GREASE NO. 000
NOTE: FREQUENCY OF LUBRICATION MUST BE GOVERNED BY THE WORKING CONDITION IN THE MINE
TYPICAL TIMKEN TAPERED BRG. ASSEMBLY - STUB AXLE TEXACO OLYMPIAN GREASE NO. 2

FREE: Texaco Maintenance Lubrication Charts are prepared in cooperation with leading manufacturers of underground mining machinery who approve specific Texaco products for use on cutters, loaders, locomotives, etc. Charts show clearly where, when and with what Texaco lubricant to service each lubrication point. Order the Charts you need by make and model of each machine.

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS— METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

TEXACO

REG. T.M.

TEXACO LUBRICANTS

Easier Starts

even at mid-winter temperatures

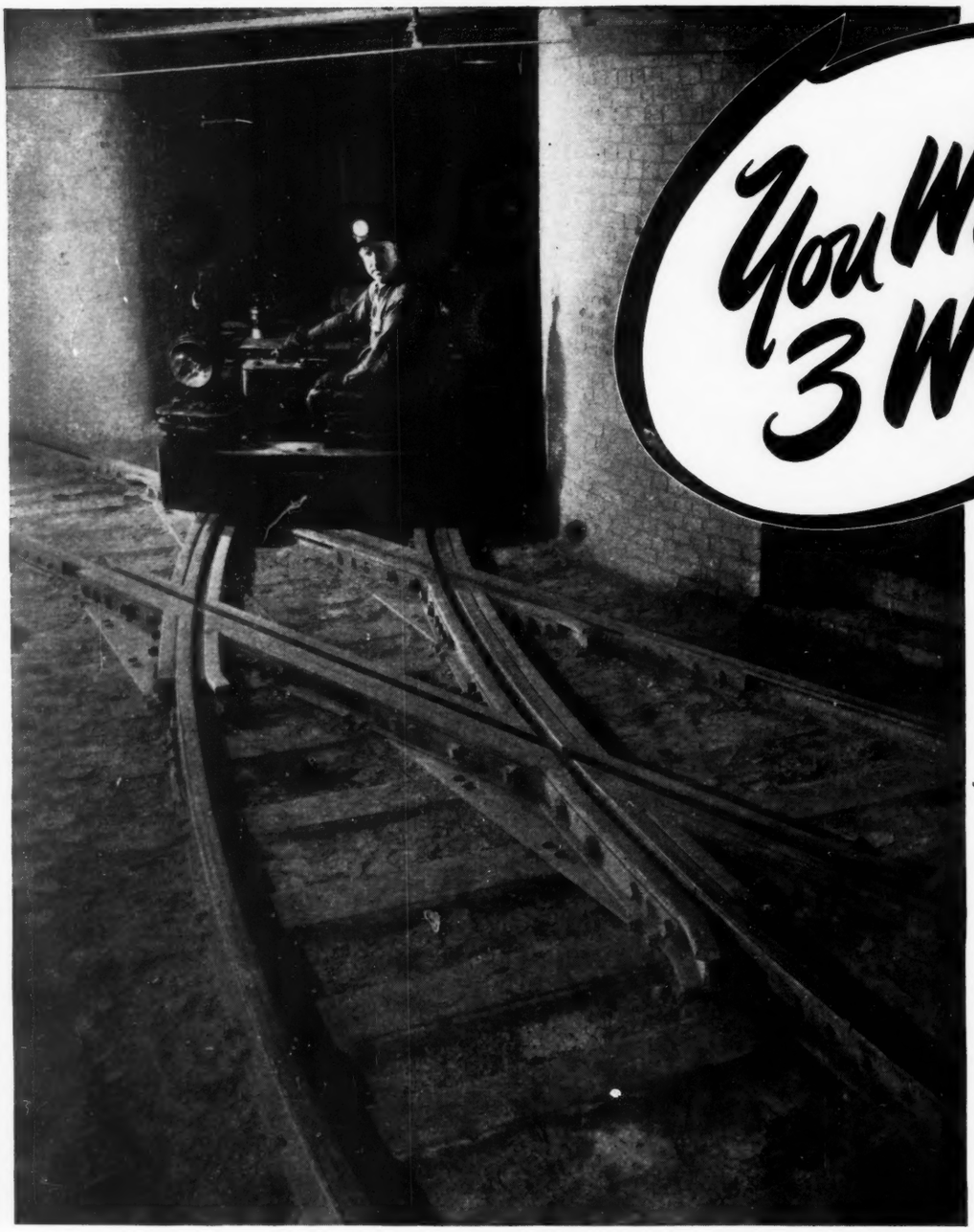
EVEN at mid-winter temperatures, mine cars start easier when wheels are lubricated with *Texaco Olympian Grease*. It is made especially for the lubrication of mine equipment. *Olympian* is a precise compound of carefully refined mineral oil and a water-insoluble base—in grades for anti-friction as well as cavity hub and solid roller bearings. *Olympian* stands up under the toughest conditions of service—cold or heat, dirt or moisture. Its protection *lasts.*

Two other advantages: Guns—and bearings—fill easier with *Olympian* than with other greases. Application is simple, quick, money-saving. Try *Olympian,* too, for cutters, loaders and other equipment.

Let Texaco Lubrication Engineering Service help you with all your lubricating problems. Just call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, *National Sales Division, Dept. C,* 135 East 42nd Street, New York 17, N. Y.

For the Coal Mining Industry



. . . with Bethlehem Prefabricated Track

Time for some housecleaning underground? There (and on the surface, too) Bethlehem Prefabricated Track will save you worry, time, expense. Here are some reasons:

(1) The track is carefully figured to meet your needs after Bethlehem engineers have studied a sketch or blueprint of your mine workings. Every detail is planned in advance.

(2) When the plan has been approved, the rails are cut to length and properly curved in the Bethlehem shops. That's one headache out of your way. The right switches, switch stands, steel ties, crossings, turnouts, guard rails, braces, frogs, joints, and bolts are chosen for the job. The outfit comes to you complete, with nothing else to buy . . . and engineered to your particular layout.

(3) With rails precurved and the cutting to length all done, all you need to do is bolt the track together. You'll have a system that will stand up under today's heavy loads . . . that will give you faster haulage, fewer derailments, higher tonnage per day.

The cost? Low. The results? High—as already proved by many big producers.

BETHLEHEM STEEL

Here's the "inside" story of SAFER FIRING

EXCLUSIVE FEATURES MAKE DU PONT ELECTRIC BLASTING CAPS SAFER. Two important improvements—nylon-insulated wires and rubber plug closures—give added measures of safety to Du Pont Instantaneous and Delay Electric Blasting Caps. These features help reduce to the minimum the risk of misfires.

The cross-section picture below shows why Du Pont Electric Blasting Caps are safer.

Nylon insulation is supplied in brilliant colors ... minimizes the possibility of error in hooking up.
Nylon-insulated wires are tough ... resist abrasion ... are equal to enamel in preventing current leakage.
Nylon-plastic insulation can readily be removed when making connections.
Nylon-plastic insulation is unaffected by sudden changes in temperature. The wires are clean and easy to handle.
Rubber plug closures provide maximum water resistance. Plug is unaffected by extremes of temperature.
Rubber plug closures are double-crimped in the shell to assure a leak-proof cap.
Shorter plug permits using cap shells from ½" to 1⅝" shorter when compared with old types. This makes priming easier, quicker, safer.
Although the shell is shorter, explosive strength is the same as old-type caps.

These exclusive features of Du Pont Electric Blasting Caps—a result of Du Pont research—represent the greatest advancement in the manufacture of electric blasting caps in over 50 years! Your Du Pont Explosives representative will show you samples. Don't run the risk of dangerous and costly misfires. Use Du Pont Caps exclusively. *Remember—the most dependable detonator is the safest detonator.* E. I. du Pont de Nemours & Co. (Inc.) Explosives Department, Wilmington, Delaware.

DU PONT
REG. U. S. PAT. OFF.

DU PONT EXPLOSIVES BLASTING SUPPLIES AND ACCESSORIES

how to keep your Sullivan —use only genuine

...but there's a big difference

From the outside they look exactly alike and both are intended for use in a Sullivan coal cutter but one is a genuine Sullivan part and the other was made by a local machine shop. The owner of the coal cutter in which the genuine Sullivan part is to be used knows that he is assured of the same high performance guarantee that his original cutter carried. The user of the other part has no such assurance.

What is the difference between these two parts? The Sullivan part is made of steel of a special analysis to take care of fatigue and rupture through stretching, for example. The local machine shop, not knowing the purpose for which the part was intended, could make it of an entirely different material which would not give the same service and possibly could result in severe damage to other parts of the cutter.

Let's take a more specific example. Suppose the part had to be made of manganese steel. Sullivan engineers say that it is an alloy of 10 to 16% manganese with 90 to 84% iron and carbon (steel). The local machinist may bid on a 3 or 5% alloy which has none of the properties of genuine manganese steel. The result is obvious.

To insure yourself against loss of production from breakdowns due to spurious coal cutter parts insist on genuine Sullivan parts.

Sullivan Machinery Company, Michigan City, Indiana.
In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

offices

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Chicago, Ill. Dallas, Texas Denver, Colo.
El Paso, Texas Huntington, W. Va.
Knoxville, Tenn. Middlesboro, Ky.
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Pittsburgh, Pa. Seattle, Wash.
San Francisco, Calif. Salt Lake City, Utah
Scranton, Pa. St. Louis, Mo.

SULL

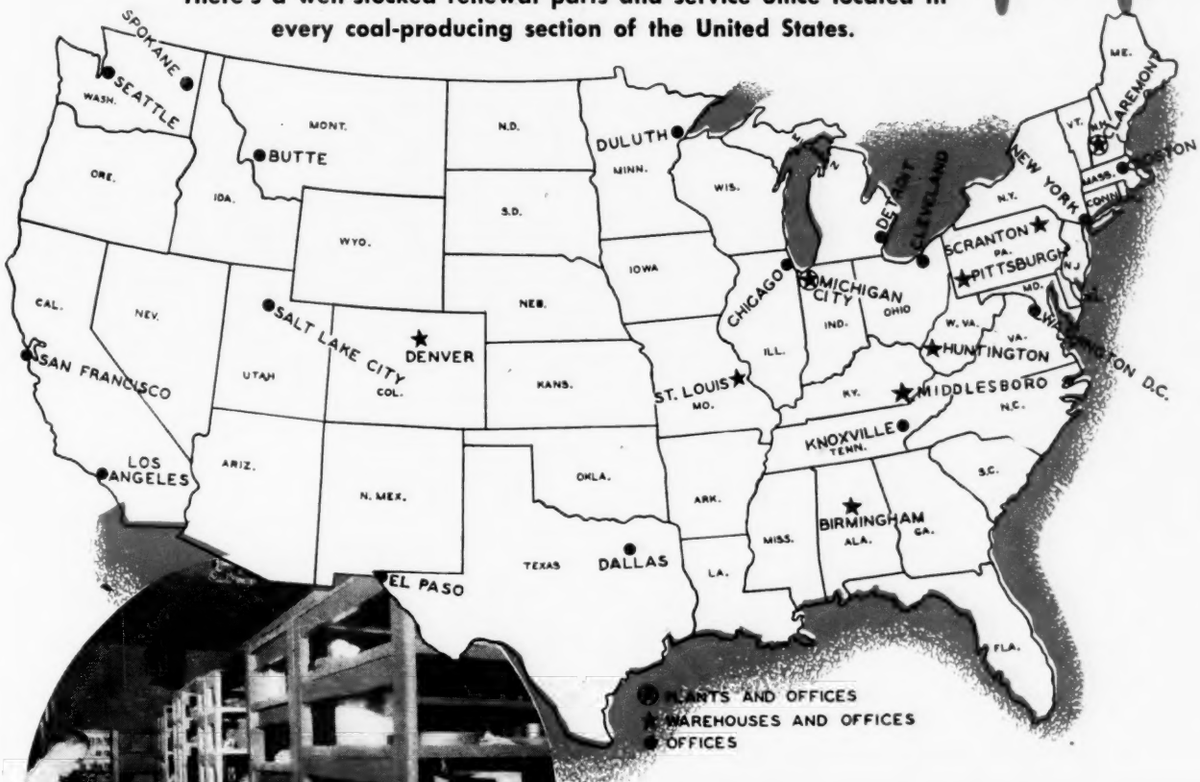
a world-wide organization . . .

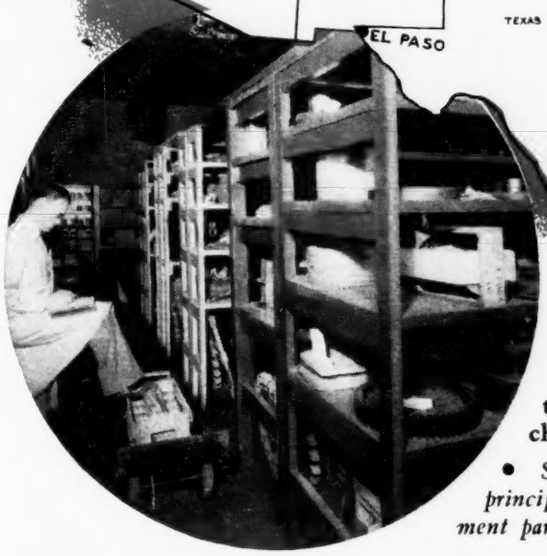
coal cutters at top efficiency...

Sullivan renewal parts

genuine Sullivan parts... are easy to get!

There's a well-stocked renewal parts and service office located in every coal-producing section of the United States.





• By ordering direct from the nearest warehouse, you can eliminate the long, costly delays and idle machinery that always run up the cost per ton. By insisting upon genuine Sullivan coal cutter parts you can be certain of keeping your Sullivan coal cutters performing at the same high standards of efficiency for which these machines are designed and built.

• *Sullivan warehouses, conveniently located in all the principal coal fields, carry a full stock of replacement parts at all times.*

IVAN

. . . established 1851 -

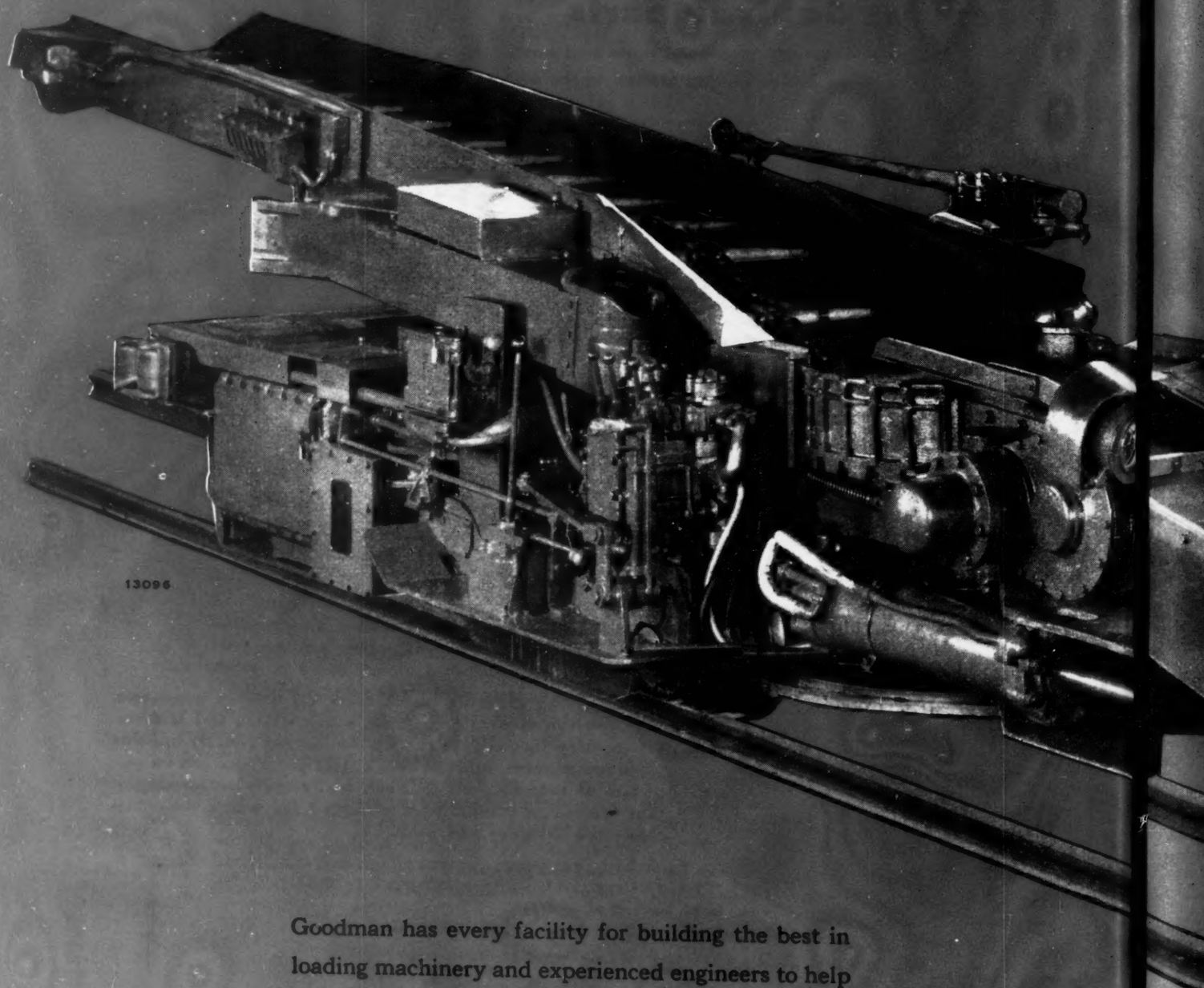
products

Coal Mining Machines • Slushers
Rock Loaders • Hoists • Car Pullers
Air Compressers • Coal Drills • Rock Drills
Cutter Bit Sharpeners and Heaters
Core Drills and Contract Core Drilling.

DETROIT PUBLIC LIBRARY

GOODMAN

FOR ALL AROUND USE



Goodman has every facility for building the best in loading machinery and experienced engineers to help you make every installation a success.

GOODMAN MANUFACTURING COMPANY

Wilkes-Barre • Pittsburgh • Huntington • Terre Haute

LOADERS

Because . . they give you maximum cleanup from rail ends forwards, between rail and rib, behind timbers, in room corners, on right angle work.

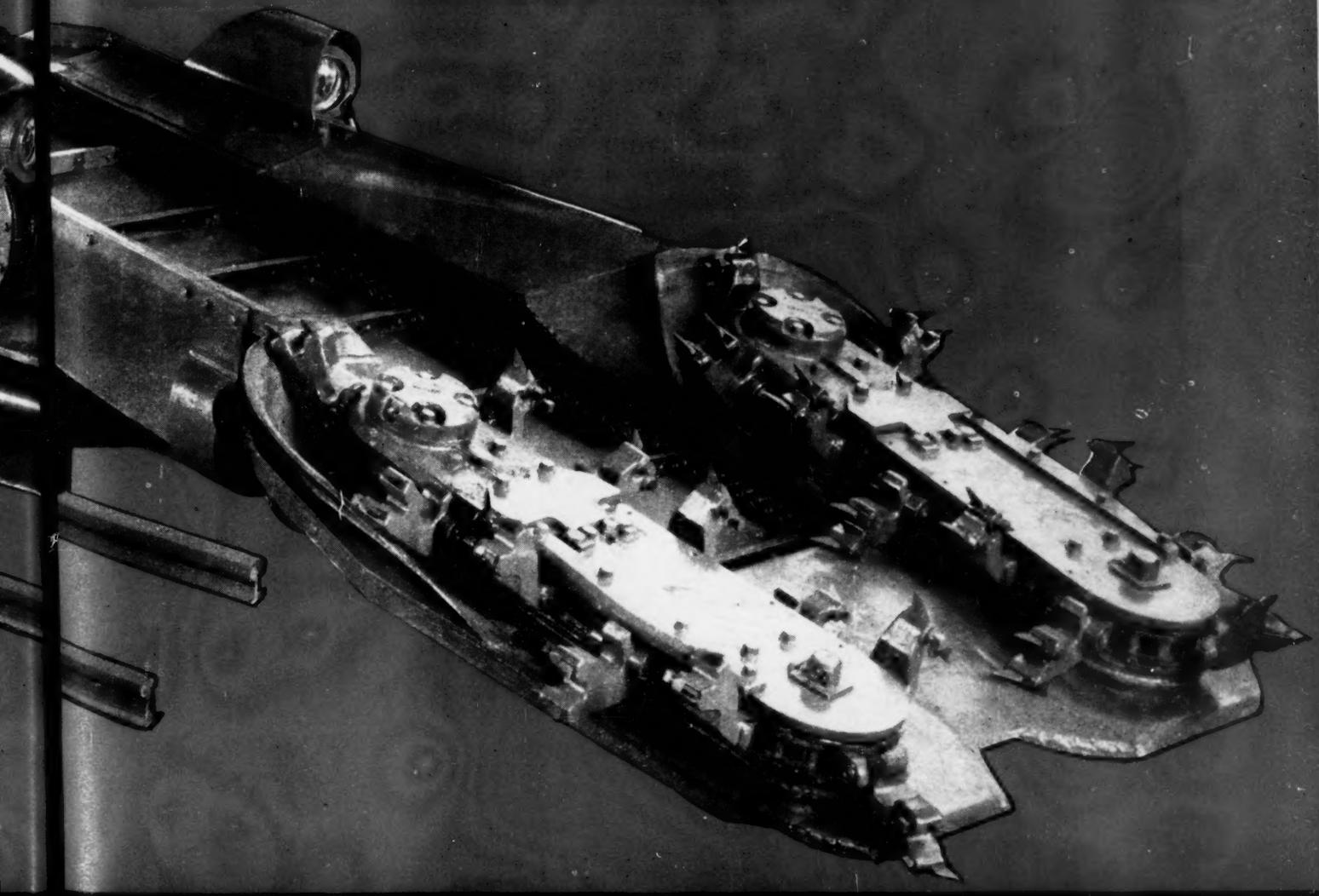
Because . . they can dig tight coal at any desirable height.

Because . . they show an increased production proportionate to an increase in the size of the cars used.

Because . . they readily handle rock or slate.

Because . . they handle easily and safely and are fast on both advance and retreat work.

Because . . inspection of all working parts is easy, maintenance is low.



HALSTED STREET AT 48TH • CHICAGO 9, ILLINOIS

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How much fuel flies out the Flue? Answer _____

THE CITIES SERVICE INDUSTRIAL HEAT PROVER WILL GIVE YOU THE ANSWER IN JUST A FEW MINUTES!

Applied to the flue or exhaust of any type of combustion equipment, the Cities Service Industrial Heat Prover analyzes spent gases—registers *immediately* on two carefully calibrated dials *the exact percentage* of unconsumed fuel and oxygen.

With this information, the Cities Service engineer can show you at once *how* to save on fuel costs... and what this saving will mean to you in dollars and cents each year.

This exclusive Cities Service instrument has been used with every kind of fuel and with every type of combustion equipment in this country.

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Cities Service Oil Co.
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Gentlemen: Please send me further information on the Cities Service Industrial Heat Prover—at no obligation to me.

Name .....

Title .....

Company .....

Address .....

City ..... State .....

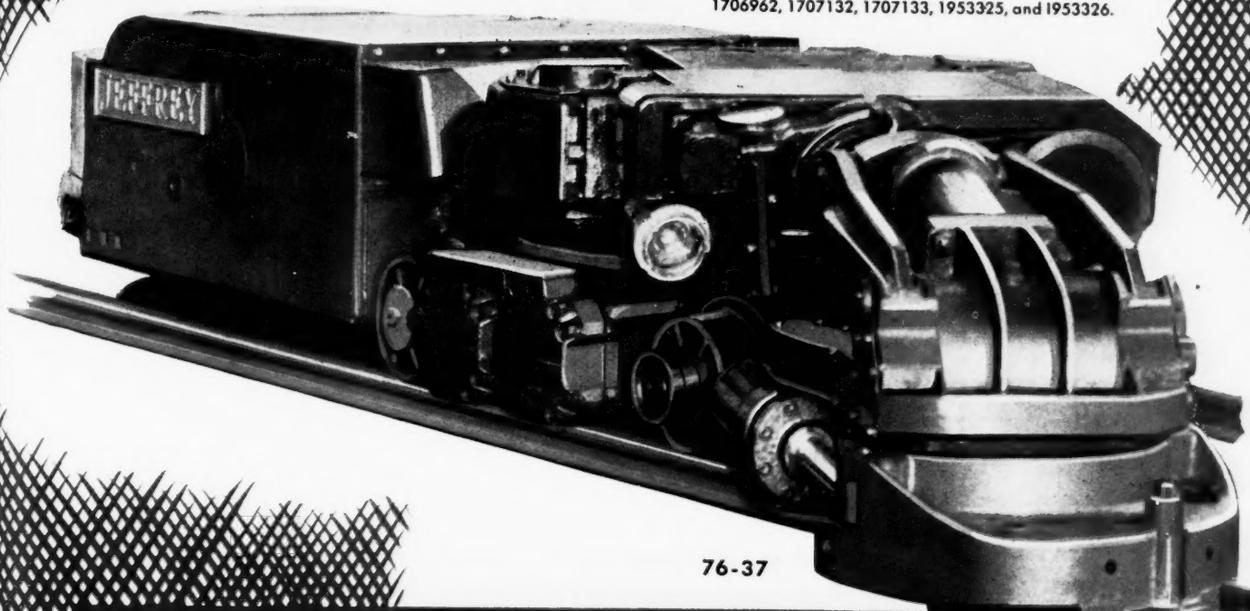
MAIL THIS COUPON TODAY

(Available only in Cities Service Marketing Territories East of the Rockies)

CITIES SERVICE OILS
ONCE-ALWAYS

JEFFREY 29-U COAL CU

Patented and Patents Pending. Also licensed under the patents of E. C. Morgan. Patents Nos. 1706961, 1706962, 1707132, 1707133, 1953325, and 1953326.

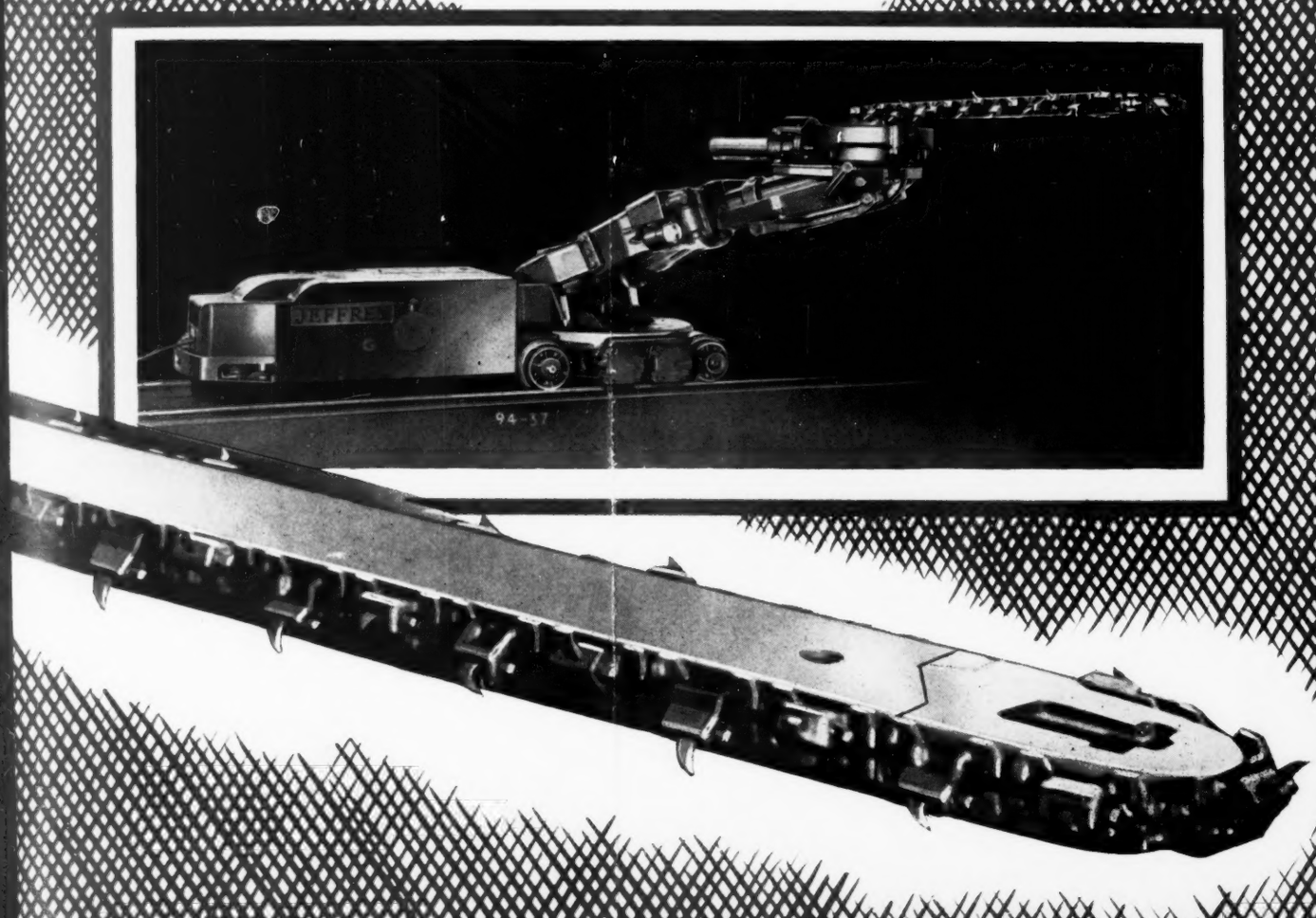


76-37

88-37

CUTTERS

Jeffrey 29-U Coal Cutters are vital factors in speeding up coal cutting operations to meet increased production schedules. No time is lost in unloading, setting up and re-loading . . . they go to work as soon as they reach the face . . . cut entire width of room from central position with one sweep of the bar. They are exceptionally flexible as they can undercut—top cut and shear. Furnished for track operation—with crawler or rubber tire mounting for trackless mining. (Patented)



D

A

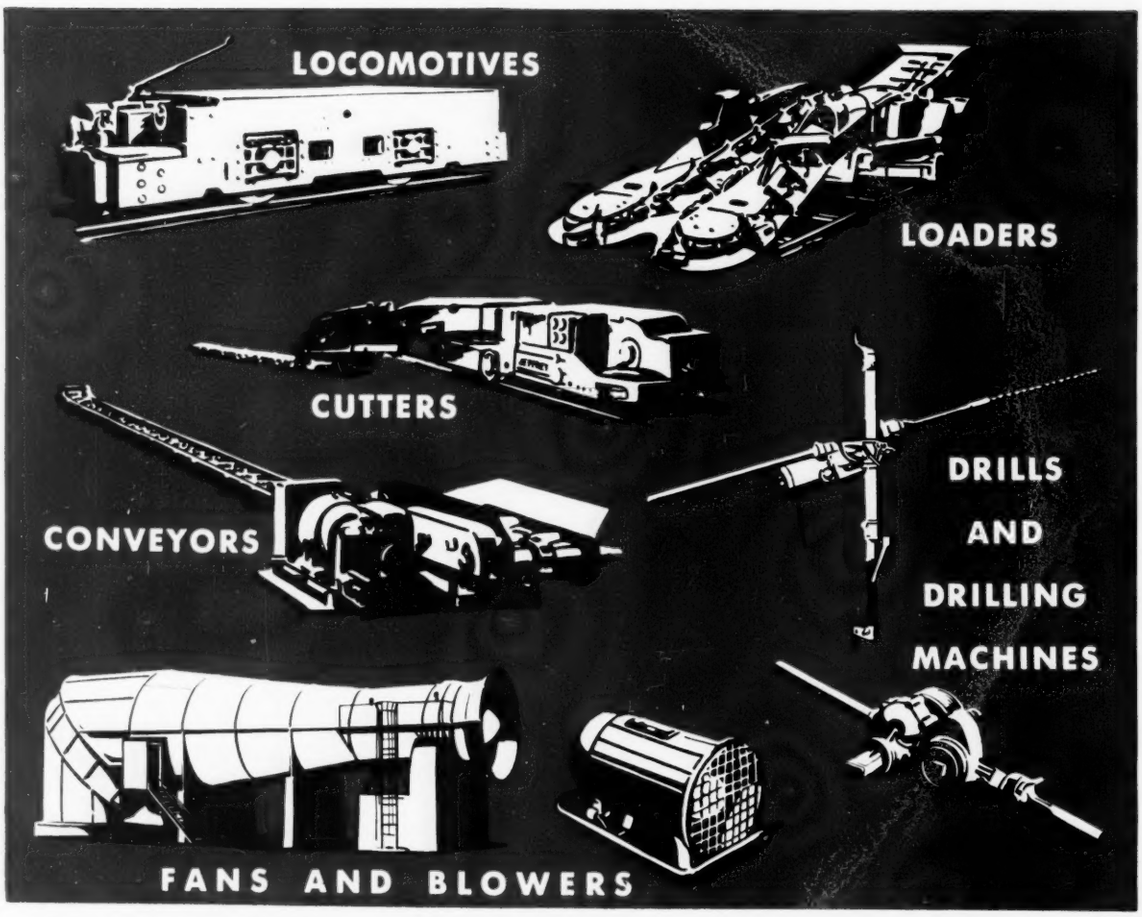
DID YOU KNOW?

Over 1000 billion cubic feet of gas for domestic and industrial use were manufactured from coal last year.

That approximately 60 million tons of coal are cut annually with Jeffrey 29-U Universal Coal Cutters.

Jeffrey
EQUIPMENT FOR COAL MINES

JEFFREY SERVICE TO THE COAL MINES MEANS SERVICE TO ALL INDUSTRY



THE JEFFREY MANUFACTURING COMPANY

Established in 1877

912-99 NORTH FOURTH STREET, COLUMBUS 16, OHIO

Sales Offices: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cleveland, Cincinnati, Detroit, Denver, Harlan, Houston, Huntington, Milwaukee, New York, Philadelphia, Pittsburgh, Scranton, St. Louis, Salt Lake City

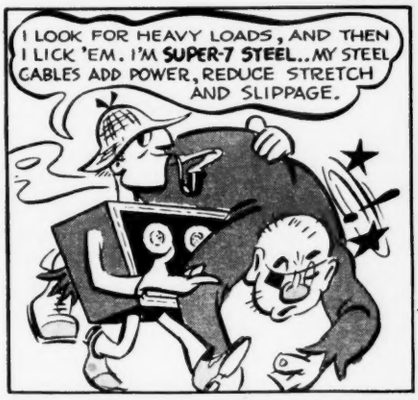
Service Stations: Pittsburgh, Harlan, Ky., Birmingham, St. Louis, Logan-Beckley, W. Va., Scranton

Foreign Plants: Jeffrey Mfg. Co., Ltd., Montreal, Quebec; British Jeffrey-Diamond, Ltd., Wakefield, England; Jeffrey-Galion (Pty), Ltd., Johannesburg, S. A.

LOOKING for TROUBLE!

Designed to stand up in trouble spots, America's newest and widest line of V-Belts — Allis-Chalmers' Texrope — solves every one of these drive problems.

I FIND MY PLACE WHERE EXPLOSION IS A DANGER. I'M SUPER-7 STATIC RESISTING; MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO THE MACHINE WHERE THEY'RE GROUNDED



Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices. It pays to make Allis-Chalmers your V-belt drive headquarters.

ALLIS-CHALMERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

A 1962

BULLETIN!

SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real time-saver... leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 132, ALLIS-CHALMERS MFG. CO. Milwaukee 1, Wis.

ALLIS-CHALMERS MFG. CO.
Dept. 132, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

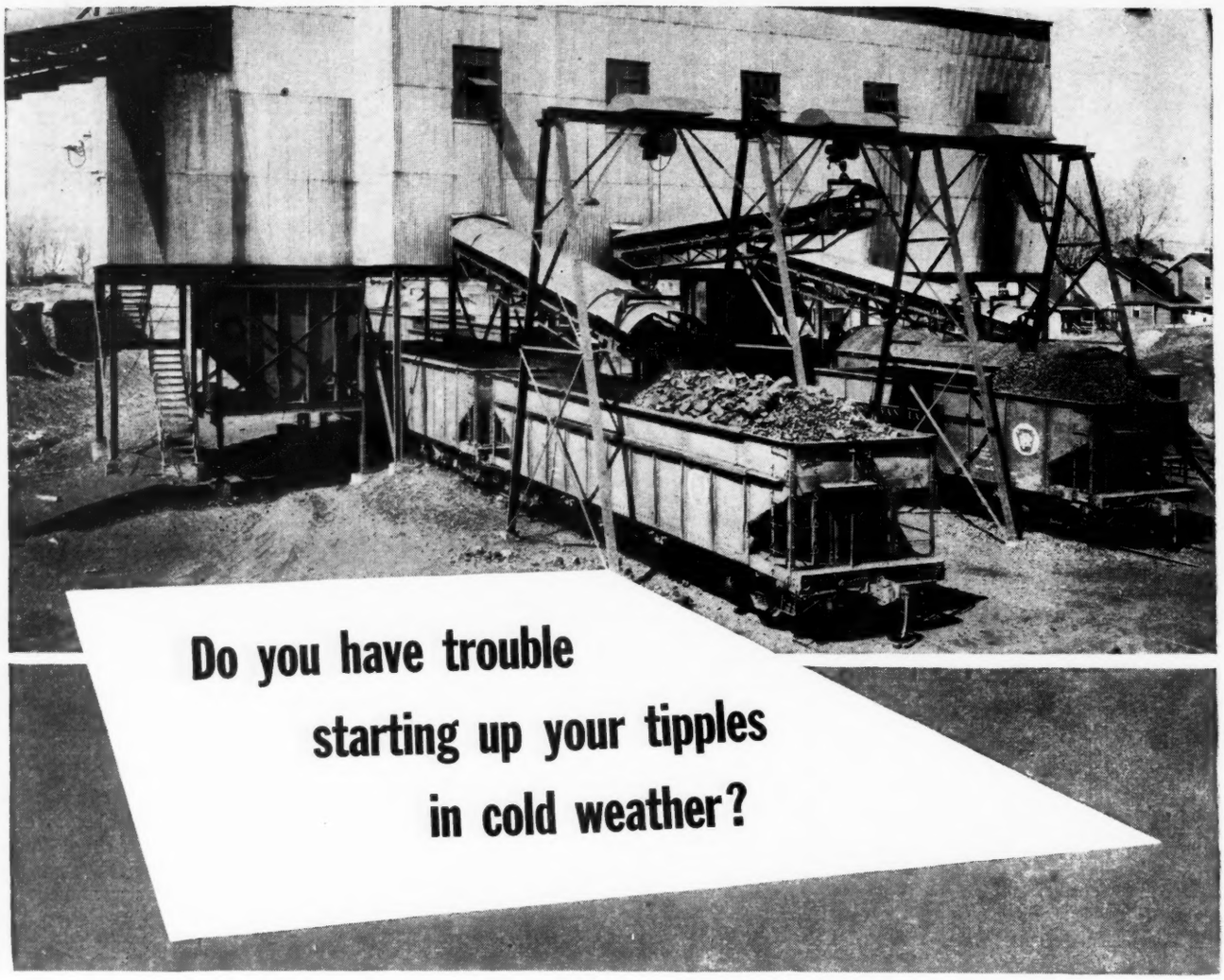
Company.....

Address.....

.....

Attn. of Mr.....

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*



Do you have trouble starting up your tipples in cold weather?

For effective help on this problem call in a Gulf Service Engineer

IF YOU HAVE TROUBLE starting up your tipples in cold weather, take a tip from scores of mines that have solved this problem with the help of Gulf Lubrication Service Engineers. For the answer is often a change in the type of lubricant or method of application.

Gulf Service Engineers have a background of thorough training and broad practical experience with all types of coal mine equipment. They know how to help you avoid operating delays of this kind through the proper application of the right lubricants.

The scientific lubrication prescribed by Gulf Service Engineers pays dividends in every phase of mine operation. It contributes to lower maintenance and power costs, fewer delays caused by mechanical troubles, greater tonnage, and improved safety.

Call in a Gulf Service Engineer today and let him help you on your lubrication and maintenance problems. Write, wire, or phone your nearest Gulf ofice.

Gulf Oil Corporation · Gulf Refining Company

GULF INDUSTRIAL LUBRICATION

Division Sales Offices:
New Orleans · Houston · Louisville · Toledo
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The LIFELINE of the Mine

"This cable's got everything it takes to stand rough treatment," says Romey.*

*Copr. 1945 RCC

Long life, as measured by months of trouble-free service on the toughest job in the mine, is built into every inch of Rome "60-38" Single Conductor Locomotive Gathering Cable.

The ideal Locomotive Cable with complete adhesion between copper conductor and the insulation. It is protected overall with a tough Neoprene jacket. This cable is recommended for electric locomotives of the gathering reel type or any other service requiring a flexible, heavy duty portable cable, where extreme adhesion of the insulation to the conductor is desired.

THE CONDUCTOR is composed of rope stranded, tinned copper wires. The individual ropes are laid up in a special manner to resist both tension and torsion.

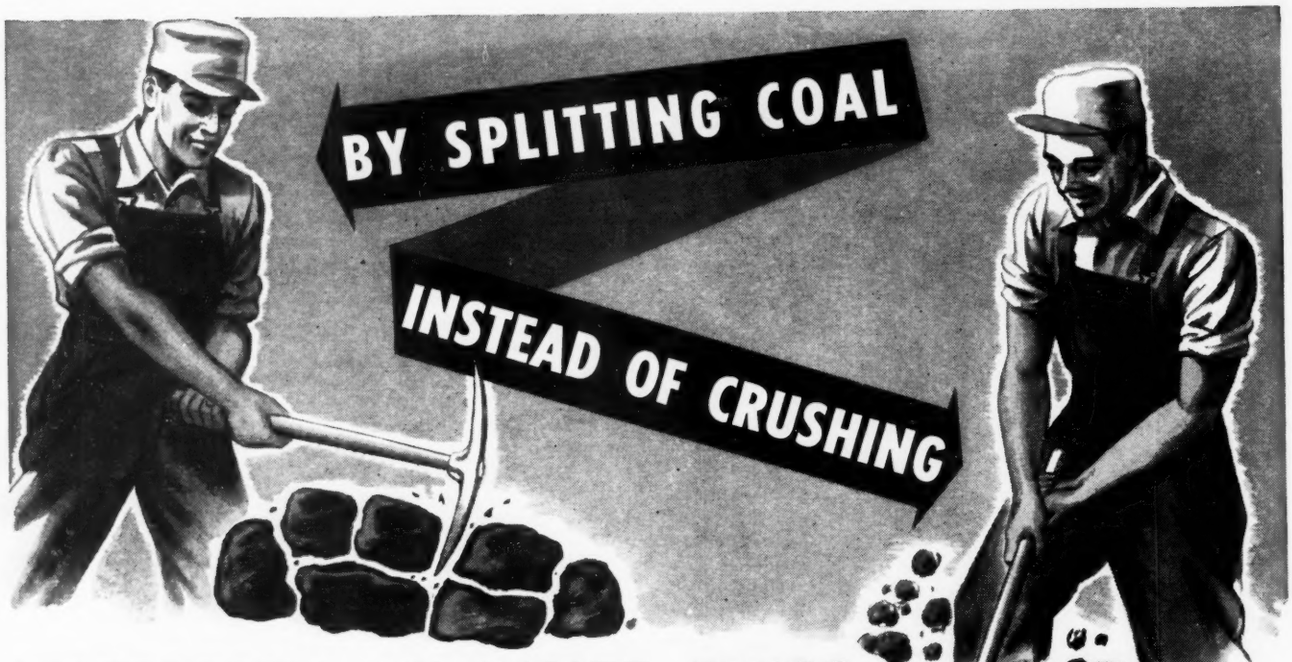
A SPECIAL INSULATION is used, which has high electrical qualities and extreme adhesion to copper conductor, which prevents separation of the conductor from the jacket.

HEAVY TWINE REINFORCEMENT CORDS are applied over insulation to strengthen the cable and control adhesion between insulation and jacket.

THE NEOPRENE JACKET is vulcanized in continuous lead molds and has a high tensile strength, maximum resistance to tearing and abrasion, and long aging characteristics.

FROM BAR TO FINISHED WIRE

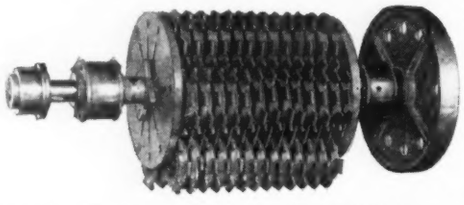
ROME CABLE
CORPORATION
ROME • NEW YORK

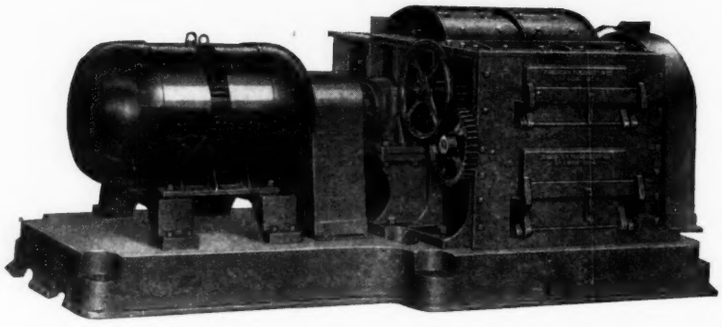


AMERICANS MINIMIZE FINES AND PRODUCE UNIFORM SIZING

ONLY AMERICANS HAVE THE SPLITTING ACTION OF THE SHREDDER RINGS

Each shredder ring (shown above) has 20 cutting edges. The many shredder rings, on the heavy rotor (shown below), revolve freely, each on their own shafts. They deflect from tramp metal —eliminating the bother with shear pins or conventional safety devices.





Nothing could better demonstrate why *American Shredder Ring Crushers produce fewer fines*—than the example of splitting coal with a pick-axe compared to crushing it with a sledge hammer.

It's the *splitting* action of the cutting edges of American's shredder rings that produces uniform sizes with a minimum of fines—and no oversize.

The *high tonnage output of Americans* is attained by the very rapid reducing action of the many cutting edges in motion. American's low power consumption (less than ½ hp per ton) is achieved through its use of *doubled* centrifugal force—the rotor revolutions *plus* the independently revolving shredder rings.

Americans operate at a *total cost* of *less than* 1c per ton!

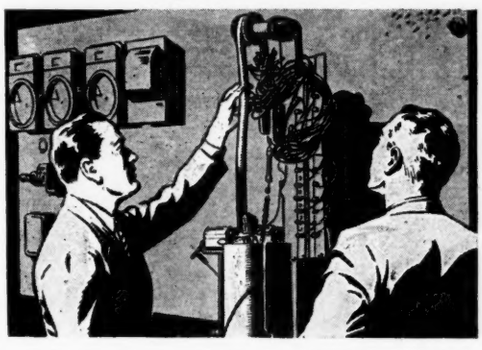
Send now for the "AC" bulletin on coal crushing data and crusher specifications.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1119 Macklind Avenue
St. Louis 10, Mo.

It doesn't take much "tortional twist" to make a cat meow "Uncle." But that's just a gentle caress compared to what our laboratory boys do in testing U.S. Royal Mining Machine and Locomotive Cables. Add to the twisting indignity, punishment by impact, compression, heat, cold and immersion in water, and you'll understand what is expected of U.S. Royal wires and cables.



THIS IS THE TWIST TEST

A 42-inch length of cord, sizes 18 to 10 Awg., is twisted through 180° in each direction while supporting a 50-pound weight and while being pulled back and forth over a 3" diameter pulley (top pulley in illustration) at the rate of 15 cycles per minute. Electrical circuit in the cable indicates failure due to a short between conductors or a broken conductor.

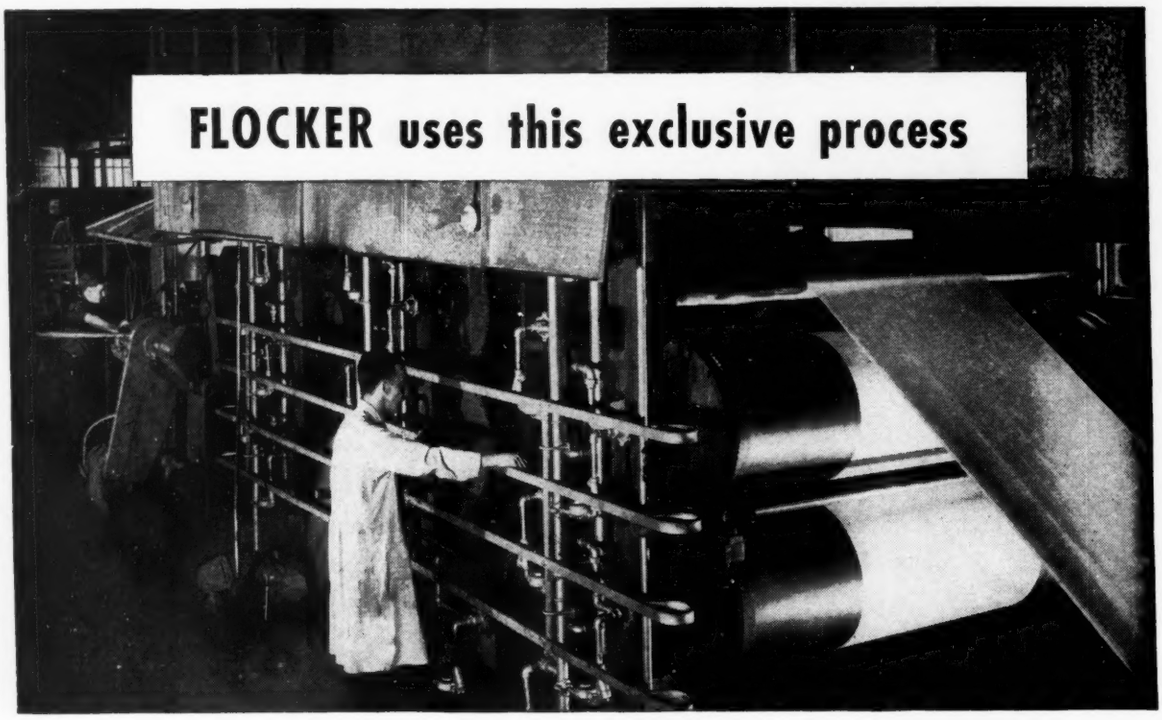
Two-Conductor Royal Cords and Cables stand a minimum of 15,000 cycles of twisting in accordance with the above test.

SPECIFY THE NEW U. S. ROYAL *Safety Tested* MINING MACHINE AND LOCOMOTIVE CABLES

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

SERVING THROUGH SCIENCE WITH ELECTRICAL CORDS AND CABLES



. . . to give you *better brattice cloth*

Flocker Moropa Brattice Cloth offers greater resistance to fire and mildew . . . stays clean longer and, under identical conditions, outwears the ordinary product.

This all-around superiority is achieved through an exclusive chemical process applied to either Jute or Cotton. The fabric is first saturated with special chemicals, then "can-dried"—a process adapted from the textile field—which thoroughly impregnates and bakes fire and mildew resisting properties into every fiber of the material.

And yet, in spite of its superior qualities, Flocker Moropa Jute Brattice Cloth costs you no more than ordinary Brattice Cloth . . . and prices are only slightly higher on Cotton. In reality, substantial savings can be realized on the use of either type.

If you're interested in the advantages this better Brattice Cloth affords, write for detailed information and quotations.

PROVED SUPERIORITY IN COTTON OR JUTE!

SUPERIOR FIRE-RESISTANCE—Protection lasts almost indefinitely, since chemicals are so thoroughly impregnated that they do not readily leach out.

SUPERIOR MILDEW REPELLENCE—Chemicals used do not absorb excessive moisture and fabric remains relatively dry and repellent to mildew.

STAYS CLEAN—Does not collect mildew "whiskers"—hence no slimy dirt.

LONGER SERVICE—Can be used and re-used over and over again. Absence of slime eliminates objections to recovery—men will co-operate in maintaining this Brattice Cloth which so vastly improves their working conditions.

JOHN FLOCKER AND COMPANY

644 GRANT STREET, PITTSBURGH 30, PA.

Since 1822, Ropes, Slings, Nets and Cordage Fittings, Tackles, Waxed and Unwaxed Linen . . . Specialists in Cordage Problems . . . Wire Rope

Flame RESISTING TIREX helps Safety

The announcement of TIREX as the first flame-resisting cable to be offered for service in coal mines makes possible a vast step forward in the safety program of the coal mining industry.

This new advancement in adding flame-resistance to the already famous Selenium Rubber Armor is another "first" in the impressive Simplex record. It means that buyers of TIREX cables get an added safety feature without an increase in cost and with no lessening of the famous wearing qualities of the Selenium Rubber Armor.

The next time you need a TIREX cable for difficult service where the added safety feature of flame-resisting TIREX Selenium Rubber Armor could be used, be sure and specify Simplex-TIREX portable cables.

TIREX
SELENIUM
Rubber Armor

Simplex

WIRES AND CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

Today-

Your *Standard*
GATES VULCO ROPES

Are Giving BETTER SERVICE Than *ANY* V-Belts Ever Built Before!

To meet the needs of our Army's tanks, tractors and self-propelled big guns in combat service, it was necessary to develop V-Belts far superior to any that had ever been built before. Gates developed and built these greatly superior V-BELTS—and here is why this fact is important to you:--

Here is the reason ✓ **Every improvement developed by Gates for these Army V-BELTS has been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.**

This is one of the very few instances in which improvements developed primarily for military use could be passed on immediately to you. Ordinarily, you would have had to wait. But in the case of Gates V-belts it was clearly recognized that industry simply had to have the best V-belts that could be made in order to maintain the production volume that was essential to winning the war.

That is why Gates has been able to pass on to you, day by day, every V-belt improvement developed for our armed forces during the war—and that is why your Standard Gates Vulco Ropes are today outperforming any V-belts ever built before!

All Gates V-Belts are Built With

The Patented
CONCAVE SIDE

Gates

THE MARK OF SPECIALIZED RESEARCH

THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

461

GATES VULCO ROPE DRIVES

CHICAGO 6, ILL., 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue. ATLANTA 3, GA., 521 C. & S. Nat'l Bank Bldg.
LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway. DETROIT 2, MICH. 223 Boulevard Bldg.
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FREE every month... your personal copy of O-B "Haulage Ways"

Would you like to...

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...read interesting articles as to how other mines are using O-B Materials effectively?

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...know how O-B Mining Materials can help you produce more tonnage at less cost.

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2704-M

Clip and Mail this Coupon for Helpful Information on O-B MINING MATERIALS

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario

Ohio Brass Co., Mansfield 1, Ohio

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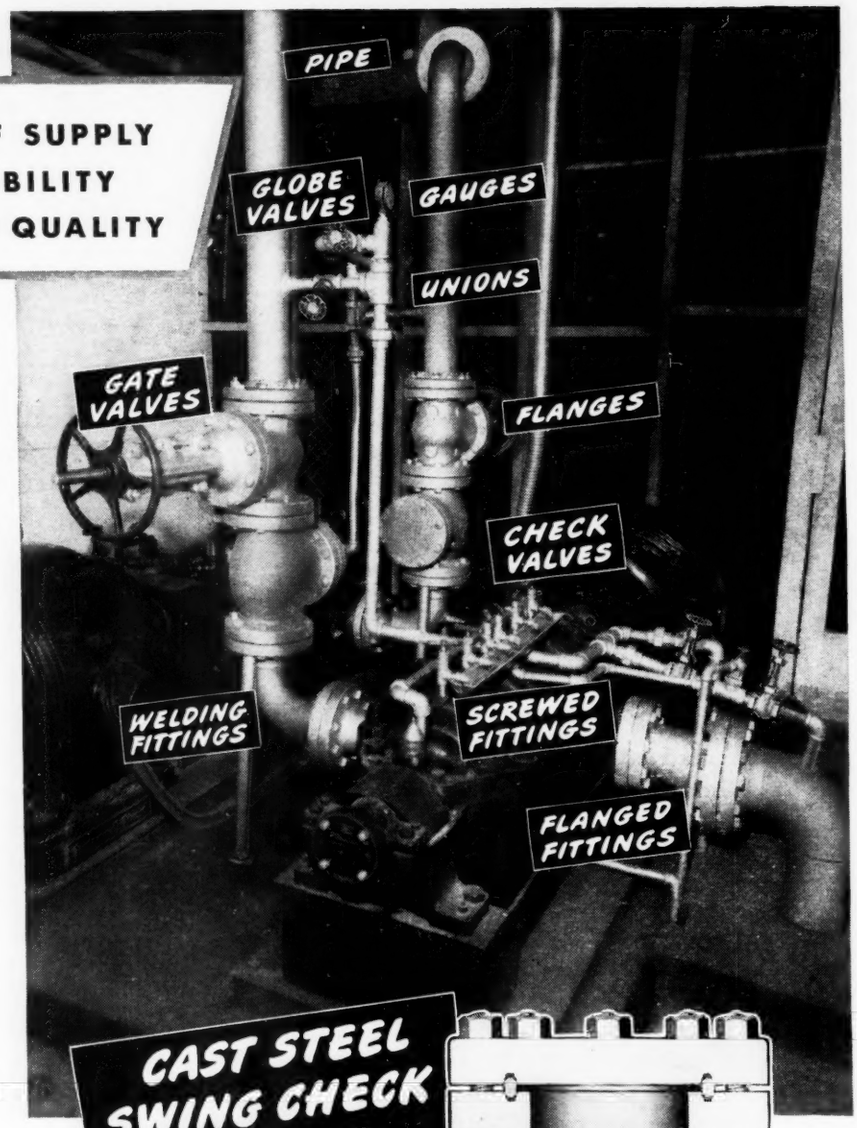
Whatever Piping Materials You Need
MAKE THEM CRANE

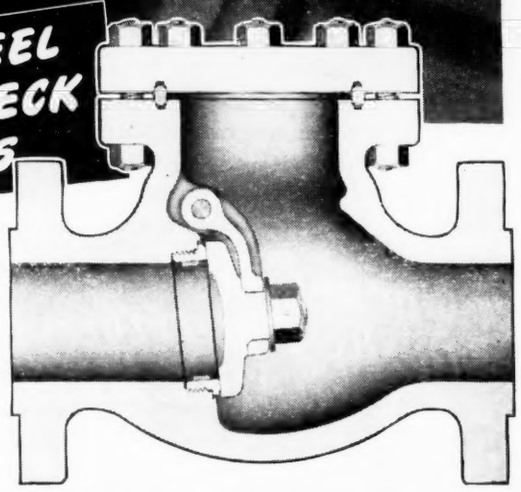
ONE SOURCE OF SUPPLY
ONE RESPONSIBILITY
ONE STANDARD OF QUALITY



Consider how using Crane *complete* piping material service simplifies deferred replacement work . . . and helps keep piping at peak efficiency. One source—your Crane Branch or Wholesaler—supplies all your requirements, in brass, iron and steel. One high standard of quality in all materials—and one responsibility behind them—help assure the best installations. And you get full benefit of Crane Co.'s 90-year experience in piping equipment manufacturing. Below is one example of a Crane solution to many of your check valve requirements.

Piping to underground seepage pump.

CAST STEEL SWING CHECK VALVES



SERVICE RECOMMENDATIONS: *Crane Cast Steel Swing Check Valves* with Exelloy to Exelloy seating materials are recommended for a wide variety of mining services—steam, water, air, gas or oil lines—for all working pressures up to 2500 pounds steam, and 6000 pounds cold. Available with screwed, flanged or welding ends in all practical sizes. See your Crane Catalog for full specifications.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. • *Branches and Wholesalers Serving All Industrial Areas*

CRANE

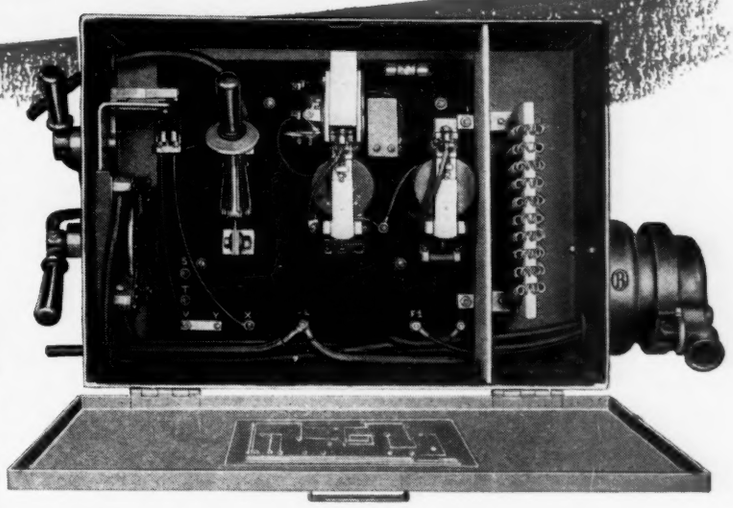
VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

QUESTION:

How to get maximum production through proper control of conveyor drives and motors for other mechanized equipment?

ANSWER:

Put these seven MINE-ENGINEERED features of the New O-B Type BD Motor Starter to work for you!



RUGGED STEEL CASE—for hard mining service. Sturdy and compact, case is of welded construction with heavily reinforced corners.

MAJOR PARTS INTERCHANGEABLE WITH KAD STARTER— uses same thermal overload, same contactors and parts, same starting resistance and same control switch as time-proved O-B Type KAD starter.

COMPENSATED COUNTER EMF TIMING—assures proper functioning without complicated mechanism. Accelerating contactor will operate correctly even under extremely poor voltage conditions or heavy motor loads.

SIMPLE DISCONNECT SWITCH— regular O-B Quick-Break switch of ample capacity mounted directly on panel.

BUILT-IN REVERSING SWITCH—interlocked with control switch to prevent motor reversal with power "on".

FOOL-PROOF ATTACHMENT PLUGS— permits motor cable-to-starter connections with unskilled workmen. No electrician required.

ACCESSIBLE BINDING POSTS— located on panel for easy connection of leads to remote switches or interlocked sequence control wires.

2635 M

Write for
DESCRIPTIVE BOOKLET 792M

Ohio Brass
MANSFIELD, OHIO
CANADIAN OHIO BRASS CO. LTD., NIAGARA FALLS, ONT.

They Know What *Coal* Means

A LOT of Americans don't know what coal means.

If asked, the average man would say casually that coal is what you burn to make heat and power.

Casually.

Just as he would say that water is something you drink.

Just try going without water.

Right now, Europe is demonstrating what lack of coal really means.

Damage to industrial plants has been found to be far less than had been supposed.

There are factories well equipped to process materials and foodstuffs, fabricate textiles and clothing, manufacture tools and utensils.

Things desperately needed.

And there are many workers' homes, many power plants, many railroad lines, locomotives, and freight cars.

Millions of hungry, ragged people in those countries want to work to produce the things they need.

But they don't have enough COAL.

Without COAL they can't heat the homes, the factories; run the power plants; operate the railroads, the machines.

Without COAL they are nothing.

Here is a grim lesson, which should impress every person in the industry with the truth that COAL is America's most important resource. That truth is the basis of much of Chesapeake and Ohio advertising; the reason for its participation in all major coal-research programs.

Chesapeake and Ohio believes in the efficiency and economy of coal for hauling both freight and passenger trains. That's why you can be sure when you ship via Chesapeake and Ohio that your coal is being hauled exclusively by coal-burning locomotives.

THE CHESAPEAKE AND OHIO RAILWAY

"The 100% Coal Railroad"

Strip routine...

From mile long pits, earth gashes, and hillside outcrops, strip miners with heavy draglines dug more than 100,000,000 tons of surface coal last year... With the easier diggings depleted, the job ahead will be tougher, the overburdens harder, thicker and more tenacious, with more rocks, shales, and heavier waste to be removed.

Whether the job calls for 5-yard draglines or giant 35-yard dippers handling over 800,000 cubic yards a month... Rochester ropes supply sturdy stamina, sinewy strength, permit faster digging and swinging, work at a lower cost per cubic yard.

For strip and deep mining, quarrying, lumbering, transportation, heavy industries ... Rochester ropes should be specified for aerial trams, shaft lines, conveyor cables... on derricks, dredges, drillers, power shovels, car pullers, gantry and crawler cranes.

Wherever tough tasks require greater strength, higher capacity, utmost safety... Rochester has the specified type, size, grade, construction—preformed or standard... all over-specification... for top performance, fewer replacements, bottom operating costs. Available for prompt shipment—now!

ROCHESTER *Ropes*

JAMAICA, NEW YORK • CULPEPER, VIRGINIA

How TOURNAPULLS fit your needs

▲ Long haul . . . 10% grades

At Scranton Mine near Hibbing, Minn., 3 Super C Tournapulls stripped 53,800 cubic yards of sandy overburden in 1454 unit hours. Each Tournapull averaged 37 pay yards per hour on 2-mile round-trip, despite 4 to 10% adverse hauling grades and unfavorable pit conditions where conventional heavy trucks could not be used. ***Tournapulls travel mine roads at 14.9 mph, climb stiff grades because of low deadweight, high traction, big 21.00x24 tires, strong "lugging" power of 150 hp Diesel engine.***

◀ Deep overburden . . . wet and sticky

At Marquette Cement Co.'s Earlham, Iowa, quarry, 5 Tournapulls are used to strip 500,000 cu. yds. of tough 40' overburden. Material runs 6 to 8' silt, 2 to 3' blue clay hardpan, 30' slippery yellow clay. Haul road drops down 20 to 30% grade into pit, returns on long 6% climb. Tournapulls average 9 trips of load-haul-and-spread per hour on 3000' cycle. On dump, LeTourneau positive ejection tailgate wipes bowl clean . . . spreads gummy clay in even layers . . . eliminates lost yards in back-haul of sticky material . . . ***Tournapulls handle any type overburden, sand, clay, hardpan, shale . . . any depth of bank.***

◀ Profitable on short 400 to 1000' Hauls

S. R. Batson Co. uses two Super C Tournapulls to strip 18' of clay and 3' of shale on 54-acre coal mine near Jasper, Ala. Tournapulls load 15 heaped yards in 75 to 85 feet in one minute. Hauls are 400 to 1000', average 800' one way. On 400' hauls, Tournapulls equal crawling tractor-scraper costs, beat crawlers on long hauls. Two Tournapulls average 3000 yards and over every 10 hours, have had only 2 hours downtime in 2 months . . . ***High speed Tournapulls give low-net-cost-per-yard on hauls of any length.***

Manufacturers of Tournapulls*, Angledozers*, Bulldozers, Tiltdozers*, Carryall* Scrapers, Power Control Units, Rooters*, Tournatrailers*, Tournacranes*, Tournatrucks*, Sheep's Foot Rollers, Tournarope*, Tournaweld*, Tournalifts*. * Trade Mark Reg. U. S. Pat. Off.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED Over 4000 Built and Shipped

FOR LOWEST NET

for STRIP PIT operation

Load iron ore . . . replace shovel-trucks ▲

Arrington Mining Co. of Cedartown, Ga., replaced 1 shovel and 4 three-yard trucks with two 15-yard Tournapulls for stripping and loading iron ore, found increased production necessitated doubling the size of their chute feeder. Tournapulls' ability to quickly switch from ore to stripping during plant delays, proved ideal for testing new areas, added to savings. Two pits are worked, one on a hill a half-mile from washer with return grades from 8 to 14%. Ore is imbedded in red clay; loads average 10 to 11 yards bank measure, weigh 3400 lbs. per yard . . . ***Tournapulls' flexibility to work anywhere on job anytime is a big advantage for mining operations.***

Load cars, feeders, conveyors ▶

At the Arrington Mine, (see above) Tournapulls built their own earth-fill ramp, dump from 36"-wide runway of 6 x 12" timbers over grizzly to plant feeder. Scraper blade is as wide as outside of tires, scrapes runway clean as ore is dumped. Commenting on Tournapull ability to profitably handle every phase of his mining operation, owner C. Arrington says: "You have to see it to believe it" . . . ***Tournapulls can dump from ramps or trestles to plant feeders and conveyors or to load cars.***

Strip 85' overburden . . . 1 mile haul ▶

At an Attapulgus Clay Co. mine near Amsterdam, Ga., 4 Super C Tournapulls strip 85 feet of sandy-clay overburden . . . haul up to a mile. ***These rigs work just as efficiently stripping a few inches of overburden as they do in a deep bank.***

Tournapulls fit mine needs because they combine scraper-loading economies with truck-haul speeds, economically move overburden back from pit, eliminate rehandling. Each unit is one-man operated, functions independently, is not subject to waiting-at-shovel delays.

M12x

TOURNAPULLS

ET COST PER YARD

Investigate Tournapull economies for your strip pit operations . . . call on your LeTourneau distributor for cost and production estimates. He has job-proved figures. Phone him today.

NOT WHAT YOU SAVE.....

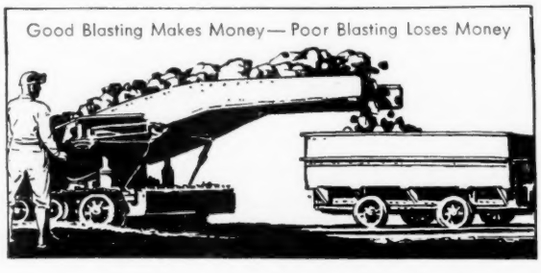
but what you get

. . that's what counts in blasting, too

It's value received that really matters, not the amount of money you spend. That's true whether you buy diamonds or explosives.

An *expensive* explosive is one that gives you poor breakage—that is hard on the loader and makes crushing slower and costlier. A really *economical* explosive is one that insures quality coal—that gets more work out of your equipment.

Price is never the first consideration—it's the use of the right explosive in the right place, in the right amount that counts. That doesn't necessarily mean buying more explosives. It means taking into account the *whole blasting procedure*. Your Atlas Representative is ready to help you along these lines. He has 25 permissibles at his command—and lots of experience on the best way of using them.



ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

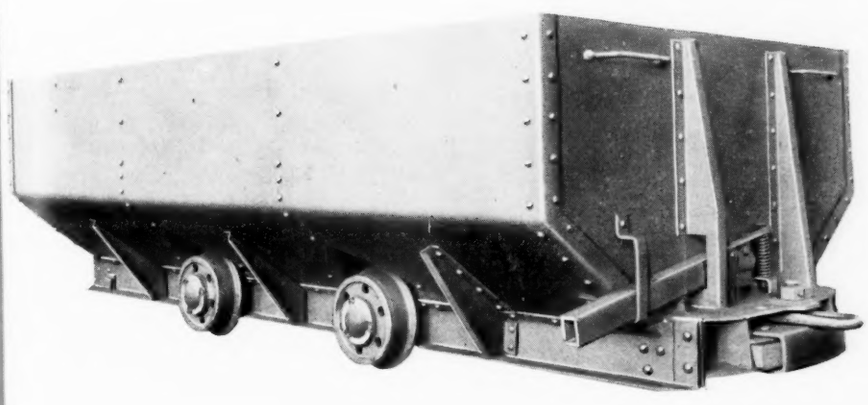
ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Automatically

unlatched, dumped and latched in 5 seconds!

Seems Remarkably F-A-S-T! Doesn't it?

Actual timing has shown that when dumping a 16-car trip of A.C.F. Drop-Bottom mine cars—"only 80 seconds elapse" from the time the first car is unlatched until the last car is latched. Automatically, of course! Meanwhile, as much as 80 tons of coal has been unloaded into the storage hopper. "A ton per second, unloading time!" Cars are returned to the mine immediately—saving precious minutes of loading time!



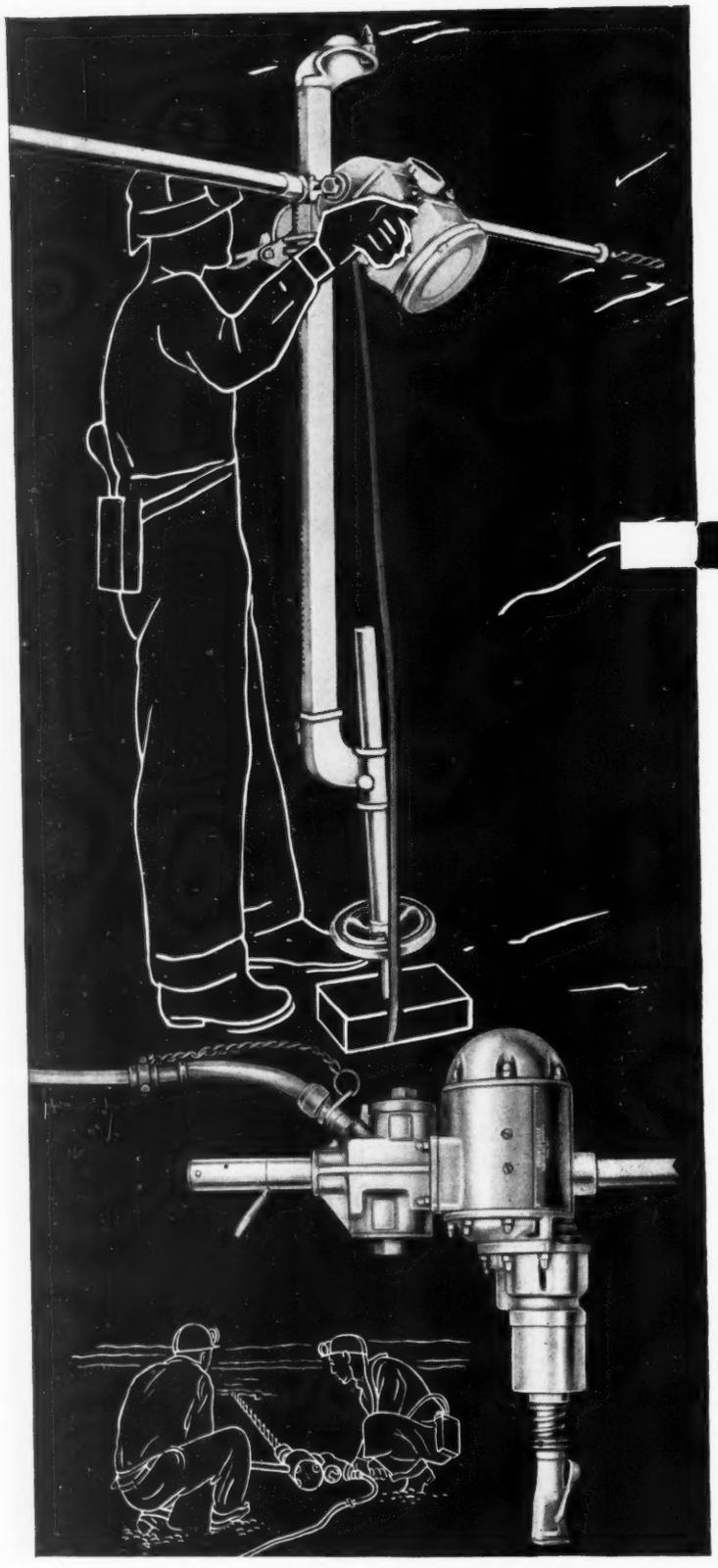
Such speed in dumping will certainly increase your daily output and lower your transportation costs! Why not investigate the possibilities of using A.C.F. Drop-Bottom mine cars in your mine?

Our Sales Representatives will be glad to discuss Drop-Bottom cars with you. Get in touch with our nearest Sales Office.

AMERICAN CAR AND FOUNDRY COMPANY

NEW YORK • CHICAGO • ST. LOUIS • HUNTINGTON, W. VA.
CLEVELAND • PHILADELPHIA • BERWICK, PA. • PITTSBURGH

a.C.f.



world's largest line of electric coal drills

CP POST-MOUNTED AND HAND-HELD COAL DRILLS

WHATEVER your specific drilling conditions, there is a CP Electric Coal Drill to do the job swiftly – and economically. Noted for their flexibility and low maintenance cost, the four CP Post-Mounted models are furnished with the exact combination of motor, hook-up, post, clutch, boxing, thread bar, auger and cutter heads to meet individual requirements.

There are five CP Hand-Held Drills including the No. 572, illustrated, and the famous CP "Whippet"—the fastest, lightest and safest electric coal drill.

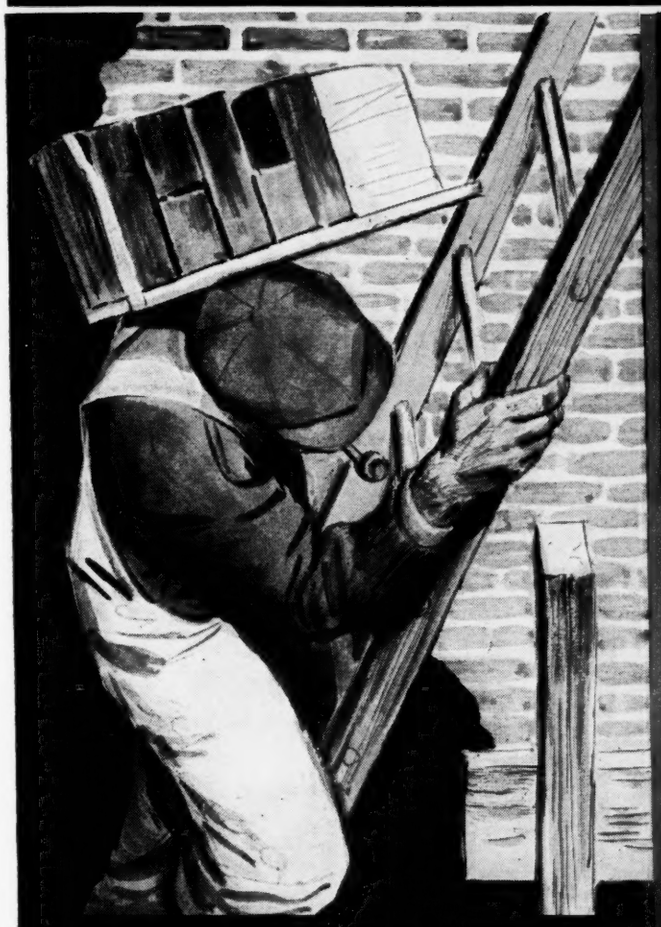
For full data on CP Post-Mounted Coal Drills, write for Catalog 901—on CP Hand-Held models, ask for Catalog 902 and S.P. 1995 describing CP "Whippet."

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Thermoid —Key to Progress in Many American Industries



The old method of getting bricks to the bricklayers has been superseded by the modern Thermoid Conveyor Belt

Here's the modern method. This Thermoid Belt was chosen because neither weather nor the sharp bricks will injure the belt.

SINCE 1880, Thermoid has contributed to the progress of American Industry. In many fields of business Thermoid Products play an indispensable part. For instance, the George Haiss Manufacturing Company, manufacturers of portable conveying equipment, chose Thermoid Conveyor Belting for the portable brick conveyor shown above.

The Thermoid Line* is the result of 65 years of research and experience that not only has kept pace with the demands of industry, but in many cases anticipated industry's needs.

The Thermoid Line* of belting and hose for materials handling and power transmission may contain the key to another step forward in the improvement of your process and the reduction of your costs.—"It's Good Business to Do Business With Thermoid."

***THE THERMOID LINE INCLUDES: Transmission Belting • F.H.P. and Multiple V-Belts and Drives • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Sheet Packings • Industrial Brake Linings and Friction Products • Molded Hard Rubber and Plastic Products.**

Thermoid Rubber

DIVISION OF THERMOID COMPANY

TRENTON 6, NEW JERSEY

Contributor to Industrial Advancement Since 1880

CARDOX

THE NON-EXPLOSIVE MINING METHOD

THESE 145 OPERATORS

Are Now Using

THE NON-EXPLOSIVE MINING METHOD

WEST VIRGINIA

American Coal Company.....(4)*
Algoma Coal and Coke Company
Ames Mining Company.....(2)
Brule Smokeless Coal Company
Canyon Coal and Coke Company
Clear Creek Coal Company.....(2)
Crab Orchard Improvement Company
Crozer Coal and Coke Company
Crystal Block Coal and Coke Company
Detroit Mining Company
Elk River Coal and Lumber Company.....(2)
Gay Mining Company
Gulf Mining Company
Hoylman Coal Company
Hutchinson Coal Company.....(2)
Imperial Smokeless Coal Company
Jacobs Fork Pocahontas Coal Company.....(2)
Katherine Coal Mining Company
Koppers Coal Div., Eastern Gas & Fuel Associates.....(2)
Mary Frances Coal Company
Minds Coal Mining Corporation.....(5)
Pardee and Curtin Lumber Company
Peabody Coal Company
Pecks Run Coal Company
Premier Pocahontas Collieries
Princess Dorothy Coal Company.....(2)
Raine Lumber and Coal Company
Raleigh-Wyoming Mining Company.....(3)
Red Jacket Coal Corporation
Scotia Coal and Coke Company
Slab Fork Coal Company
South Side Company
Standard Fire Creek Coal Company
Truax-Traer Coal Company
United Pocahontas Coal Company
Weyanoke Coal and Coke Company.....(2)
Winding Gulf Collieries
Wood Coal Company

VIRGINIA

Blackwood Fuel Company
Buchanan County Coal Corporation
Coal Processing Corporation.....(2)
Jewell Ridge Coal Corporation
Page Pocahontas Coal Corporation.....(2)
Panther Coal Company
Red Jacket Coal Corporation
Sycamore Coal Corporation

KENTUCKY

Bell Coal Company
Big Jim Coal Company
Blue Bird Mining Company
Cinderella Coal Corporation
Creech Coal Company
W. G. Duncan Coal Company
Elkhorn Coal Company
Fourseam Coal Corporation
Hart Coal Corporation
Harvey Coal Corporation
The Kenmont Coal Company
Knott Coal Corporation
Marlow Coal Company
Stoker Coal Company
Utilities Elkhorn Coal Company.....(2)

TENNESSEE

Block Coal and Coke Company
Straight Fork Coal Company

PENNSYLVANIA

Berwind White Coal Company.....
Butler Consolidated Coal Company
Consolidation Coal Company
Moffit Coal Company
Pittsburgh Coal Company.....
Edward Tomajko
Westmoreland Coal Company.....

*INDICATES NUMBER OF MINES USI
THE NON-EXPLOSIVE MINING METH

CARDOX CORPORATION

ANNUAL *Roll Call*

OHIO

Hanna Coal Company of Ohio.....(2)
Midvale Coal Company
Mine No. 6 Inc.
Warner Collieries Company.....(2)

ILLINOIS

Bell and Zoller Coal and Mining Co.....(2)
Blue Bird Coal Company
Consolidated Coal Company
Dering Coal Company
Franklin County Coal Corporation
New Coal Company.....(5)
Old Ben Coal Corporation
Peabody Coal Company.....(2)
Sahara Coal Company
Thermal Coal Company
Truax-Traer Coal Company
Union Colliery Company

INDIANA

Chesser Coal Company
Glendora Coal Company.....(2)
Ingle Coal Corporation.....(3)
Knox Consolidated Coal Corporation
Linton Summit Coal Co.
Pyramid Coal Corporation
Standard Coal Company

IOWA

Shuler Coal Company

OKLAHOMA

Buck Creek Mining Company
Choctaw Smokeless Coal Company
Keener Coal Company
Premium Smokeless Coal Company
Reliance Smokeless Coal Company

COLORADO

Black Diamond Fuel Company.....(3)
Boulder Valley Coal Company
Canon Black Diamond Coal Company.....(2)
Canon Monarch Coal Company
Canon National Coal Company.....(2)
Clayton Coal Company
Colorado Fuel & Iron Corporation.....(3)
Colowyo Coal Company
Consolidated Coal & Coke Company
Crested Butte Coal Company
Cribbs-Goodman Coal Company
Crow Bar Coal Company
Domestic Coal Company
Double Dick Coal Company
Dry Creek Coal Company
Giuliano and Sons Coal Company
Graden Coal Company
Griffith Coal Mining Company
Imperial Coal Company
Keystone Coal Company
Liley & Merlino
Louisville Lafayette Coal Co.
McNeil Coal Corporation
National Fuel Company.....(2)
Nu-Shaft Canon Coal Company
Oliver Coal Company
Rocky Mountain Fuel Company
Royal Gorge Coal Company
Shamrock Coal Company
Taylor Coal & Mining Company
Vento Coal Company.....(2)
Victor-American Fuel Company.....(2)
William E. Russell Coal Company

MONTANA

Roundup Coal Mining Company

WYOMING

Burnell Coal Mines
Colony Coal Company
Sheridan-Wyoming Coal Company.....(2)

UTAH

Barber Asphalt Company
Uta-Carbon Coal Company

CANADA

Atlas Coal Company, Limited
Lethbridge Collieries, Limited
The Monarch Coal Mining Company, Limited
Red Deer Valley Coal Company, Limited
West Canadian Collieries.....(2)
Western Gem & Jewel Collieries, Limited

MEXICO

American Smelting & Refining

CARDOX
HARDSOCG
DRILLING EQUIPMENT
Complete line of drilling equipment designed to give you the maximum in drilling efficiency.

· BELL BUILDING · CHICAGO

BOWDIL FABRI-FORGED CUTTER BARS AND CHAINS

YOUR COAL MINING OPERATIONS must become increasingly efficient if you are to make money in spite of rising costs and competitive power resources. Bowdil, all through the war, has anticipated the need for improved machinery to get out the tremendous tonnages demanded in the coming years. In pit tests, under all imaginable conditions, Bowdil has proved the superiority of a new design in coal cutting machinery.

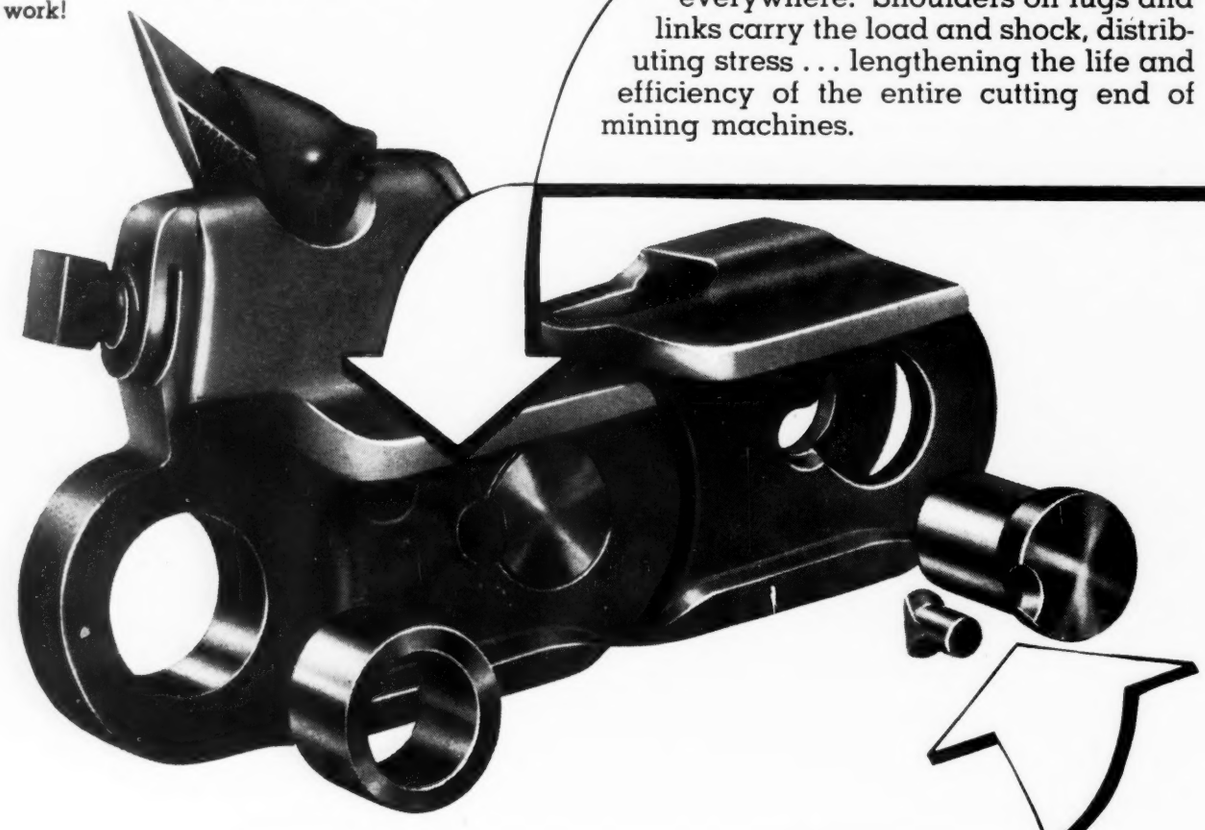
NOW—ready for immediate delivery—Bowdil presents the advanced equipment you must have for profitable, progressive coal mine operation.

The critical operating part of coal mining machinery is the chain carrying the cutter bits. Bowdil has perfected a unit that eliminates the five common shortcomings of chains in general use today. The Bowdil Fabri-Forge Chain design features these improvements:

1—TRUE-RUNNING TRACK GUIDE. Bowdil's radial track guide makes chain circle the head at correct angle. Smooth, wobble-free run prevents damage to guide or wearing strips. **2—NO WEAK LINKS.** Bowdil's drop forged lug body and symmetrical connector are of equal strength . . . built with a margin of resistance for many times the normal load. **3—EASY MAINTENANCE.** Bowdil's Fabri-Forge Chain is easy to connect, remove or replace. Large locked hardened pin and bushing take the wear. **4.—FITS YOUR JOB.** Bowdil's bit-carrying body is securely welded on chain to meet any condition or requirement for position, lacing or kerf.

5—REDUCES OPERATING COST. Bowdil's one-piece holder, wedging bit securely in lug projection, can be quickly and economically inserted. No need to halt production for complete chain replacement. Make unit repairs fast—and get back to work!

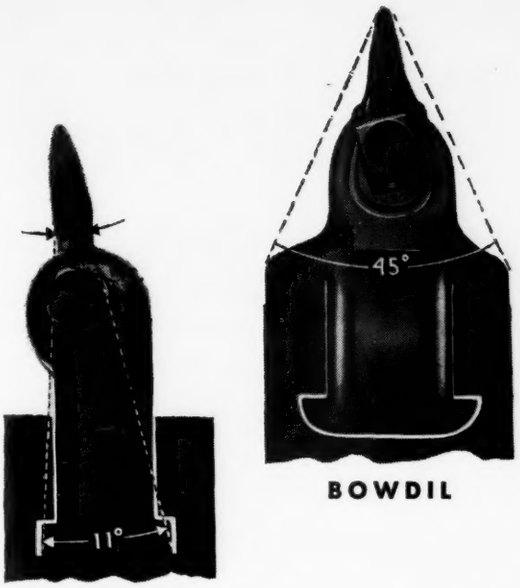
• Approved by mine operators everywhere. Shoulders on lugs and links carry the load and shock, distributing stress . . . lengthening the life and efficiency of the entire cutting end of mining machines.



• Simple, ingenious rivet lock principle is assembled quickly, holds securely and comes out easily when you want the chain apart.

BOWDIL

COAL CUTTING EQUIPMENT



BOWDIL

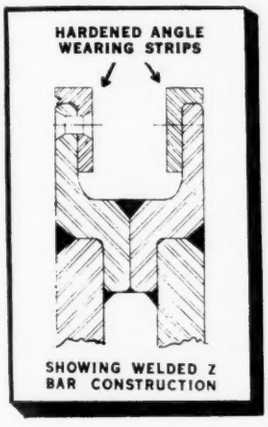
CONVENTIONAL

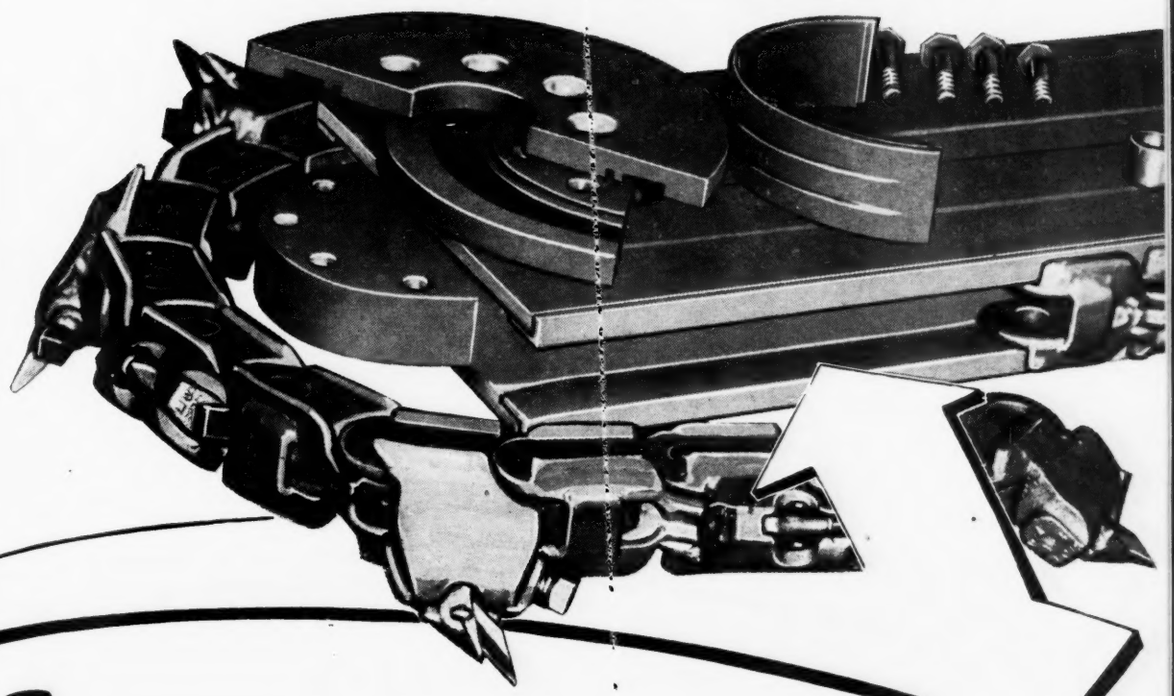
1—BEARING SURFACES INCREASED

2—LEVERAGES REDUCED OVER ONE HALF

3—DEFLECTION STABILIZED

With Bowdil's famous Concave Cutter Bits in the holders, this equipment will definitely prove operating economy for you.





This bar represents Bowdil's latest effort in design of the cutting end of mining machines to meet the present day demands for Strength, Power Saving and Coarse cutting.

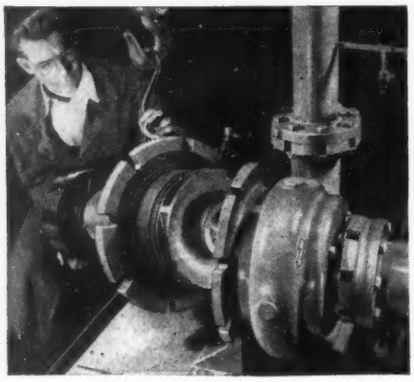
- No rivets are used in the body of the Bowdil Cutter Bar or chain, thus retaining full material strength. It is a known fact that numerous rivet holes weaken the material.
- Actual tests made by exerting measured pressure between 3' centers show—Conventional bars 4" thick will bend with 25 to 35 tons. Bowdil Z bars 3" thick will bend with 40 to 50 tons.
- These bars being made from high physical alloys will not kink—insuring long, efficient service. Standardization enables us to make good delivery on bars for all types of machines.

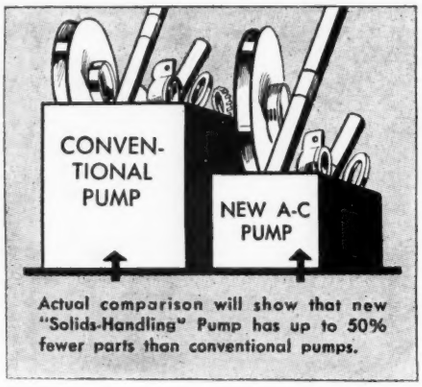
The BOWDIL COMPANY

CANTON 4, OHIO

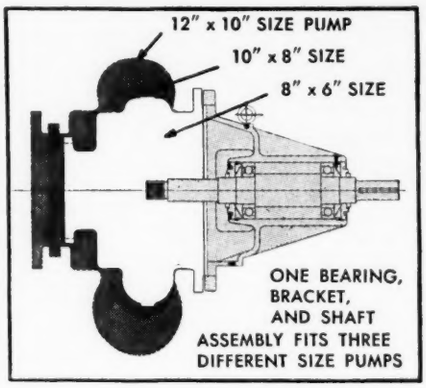
Remove Entire Rotating Element WITHOUT DISTURBING PIPING

Get 2 to 4 Times Longer Life, Cut Parts Inventory Much as 2/3, With New A-C Solids-Handling Pumps!





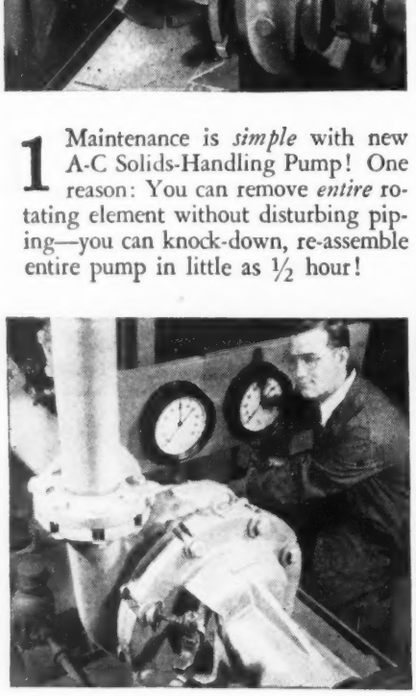
Actual comparison will show that new "Solids-Handling" Pump has up to 50% fewer parts than conventional pumps.

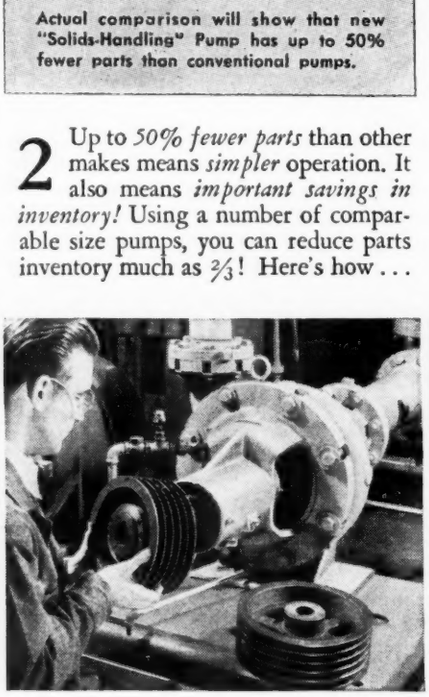


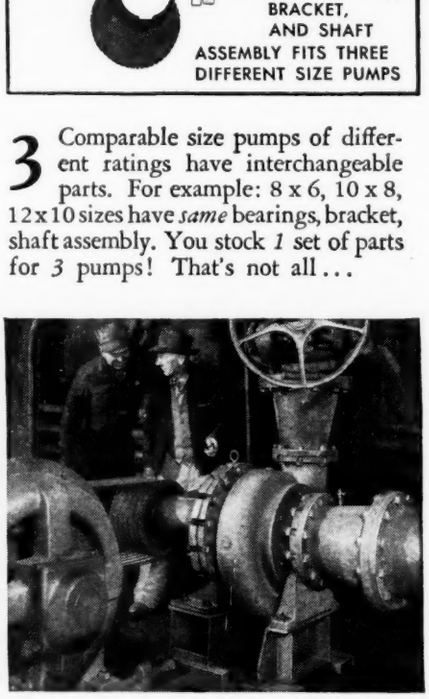
1 Maintenance is *simple* with new A-C Solids-Handling Pump! One reason: You can remove *entire* rotating element without disturbing piping—you can knock-down, re-assemble entire pump in little as ½ hour!

2 Up to *50% fewer parts* than other makes means *simpler* operation. It also means *important savings in inventory!* Using a number of comparable size pumps, you can reduce parts inventory much as ⅔! Here's how . . .

3 Comparable size pumps of different ratings have interchangeable parts. For example: 8 x 6, 10 x 8, 12 x 10 sizes have *same* bearings, bracket, shaft assembly. You stock *1* set of parts for *3* pumps! That's not all . . .







4 These new pumps give you *2 to 4 times longer life* than ordinary pumps! Reasons: *new* design, *special* alloys. What's more, they compare favorably in price with ordinary high efficiency pumps! And *range?*

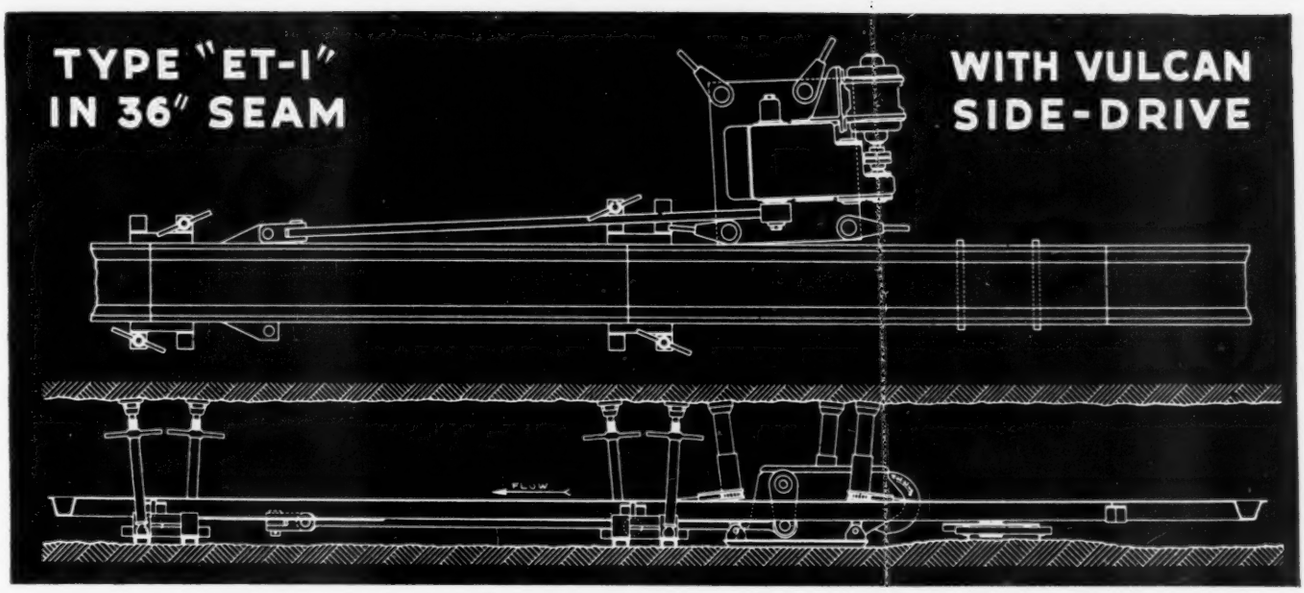
5 By merely changing motor and drive, or drive alone — you get *wide* capacity range, up or down. You don't have to touch pump or parts — *not even impeller!* Summing it all up, here's what one operator reports . . .

6 "Downtime cut 400%; power savings $7 a day; parts inventory cut 70%!" No wonder new A-C "Solids-Handling" Pump gives you a *lower cost per ton of solids handled than comparable makes!*

A 1912

WANT MORE FACTS? Call this experienced engineer in your nearby A-C district office. Discuss your pumping problem with him. Or, Write direct for Bulletin B6381. ALLIS-CHALMERS, MILWAUKEE, WIS.

ALLIS-CHALMERS
"Solids-Handling" Pumps



SHAKING-CHUTE CONVEYORS

For Low-Height Coal

More than a quarter-century of successful experience in the design and manufacture of shaking-chute conveyors has taught Vulcan engineers where trouble is most apt to develop and how to guard against it. The ET-1 Drive Unit here illustrated "HAS EVERYTHING", therefore, to assure efficient service at minimum expense for maintenance and repairs.

Equipped with oversize heat-treated alloy-steel gears and shafts mounted on anti-friction bearings in an oil-tight cast-steel housing, it drives several hundred feet of heavily-loaded chute for long periods of time without need for any other attention than occasional lubrication. With the Vulcan side-drive connection shown in the diagrammatic illustration above it can be installed in seams as low as 22" without taking up rock and without need for an extended bed plate, outboard bearing or any of the other accessories required for some other types of side-drive connections.

Write us regarding any underground coal or rock handling requirement. We not only manufacture a widely-used and highly developed line of Shaking-Chute Conveyors but also an equally complete and service-proved line of Chain Conveyors, so that our experienced engineers can afford to be absolutely impartial in their recommendations. Bulletins containing complete working data mailed promptly on request.

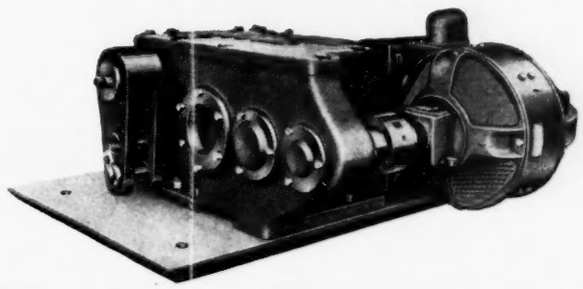


Illustration above shows Vulcan Shaking-Conveyor Drive Unit, Type ET-1, driven through flexible coupling by 15 hp. electric motor. When desired, a compressed-air motor of comparable power can be mounted on the same bed-plate without increasing the overall height of 20¼". Construction throughout is simple and rugged with minimum number of working parts. Powerful cast-steel housing and cover-plate have demonstrated ability to withstand heavy rock falls without damage to enclosed parts.

VULCAN IRON WORKS, Wilkes-Barre, Pa., U.S.A.

William M. Bailey Company
703 Magee Building
Pittsburgh 22, Pa.

Long Super Mine Car Co., Inc.
Fayetteville, West Virginia

Keiser-Geismer Engineering Co.
1309 First National Bank Bldg.
Birmingham 3, Alabama

Heavy-Duty Electric Hoists
Self-Contained Hoists
Scraper Hoists
Car-Spotting Hoists
Room Hoists

Shaking-Chute Conveyors
Chain Conveyors
Cast-Steel Sheaves and Gears
Cages, Skips and Gunboats
Coal-Preparation Equipment

Steam Locomotives
Diesel Locomotives
geared and electric drive
Gasoline Locomotives
geared and electric drive

Load-Carrying Larries
Rotary Kilns, Coolers and Dryers
Crushing Rolls and Pulverizers
Briquetting Machines
Ball, Rod and Tube Mills

LIKE A CHAMPION FENCER

FORM-SET ROPE IS *Relaxed*

Study the fencer's movements. Watch him in action. He's graceful, agile, light on his feet. Muscles flow freely. There's nothing about him suggestive of tension. He's learned to *relax* while engaged in a contest of skill and endurance.

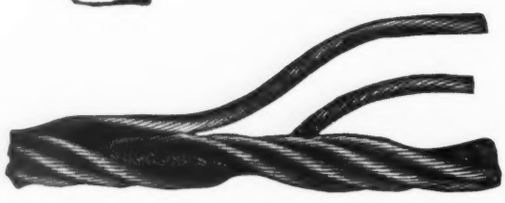
In Bethlehem's Form-Set rope, you'll find much of that same relaxed effect—a quality that pays heavy dividends.

Every wire and strand of Form-Set rope is preformed into a permanent helical shape before being laid in the rope. This means that the inner tension has been eliminated. The wires and strands have no tendency to "fight themselves" or each other.

You can prove this simply by cutting a section of Form-Set, leaving it unseized. Each and every wire lies just as it was. No bushing—no flying apart—for the wires and strands are *relaxed*.

What does this mean? For one thing, easier handling. More important, though, is the longer life that often results when the rope is subjected to sharp turns and bends—reverse bends, for instance.

All grades, sizes, and types of Bethlehem wire rope can be obtained with the Form-Set construction. Ask the nearest Bethlehem office or distributor to tell you more about it.



Here is a piece of "relaxed" wire rope. Even when cut or broken, the Form-Set wires and strands lie calmly in place. No tension at all—yet the toughness remains.

When you think WIRE ROPE . . . think BETHLEHEM

WALTER TRACTOR TRUCKS DO A *Complete* STRIP MINE JOB!

- ✓ Haul 60 Tons of Coal
- ✓ Haul 20 cu. yds. of Overburden
- ✓ Haul in any weather, any running conditions

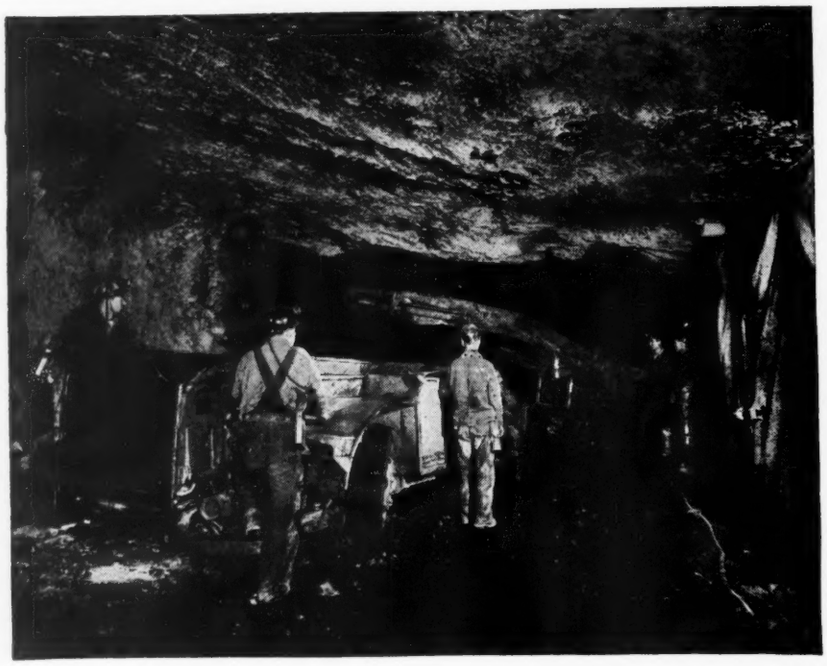
You don't need two different types of trucks for hauling coal and overburden. ONE truck—the Walter Tractor Truck—does an exceptional job handling *both*. It has the power to pull two coal trailers with a 60 ton payload, at speeds that roll up tonnage records. It has the traction to haul overburden in 20 cu. yd. side dump trailers through broken ground, loose dirt, soft mud and up steep grades. Same truck — simply switch trailers.

Key to this performance is the Walter Four Point Positive Drive, which efficiently converts the 300 H.P. engine's torque into 100% traction. Three automatic locking differentials proportion the power to the FOUR driving wheels according to the traction of each wheel at any instant. Thus, wheel spinning is eliminated, preventing tire grinding and road gouging. Greater power is transmitted by the Suspended Double Reduction Drive, placed safely out of the way of jutting rocks, stumps and high crowns. Other features include tractor type transmission, engine-ahead-of-wheels, hydraulic steering, and air brakes. Write for the complete story.

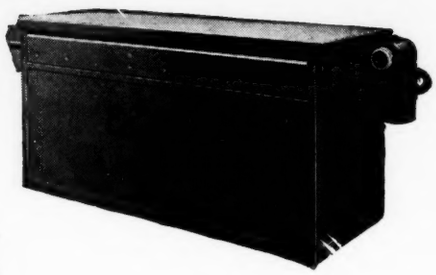
WALTER MOTOR TRUCK CO. 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

WALTER TRACTOR TRUCKS

BATTERY-OPERATED Shuttle Cars Shorten Gathering Trips...



Courtesy of Engineering & Mining Journal



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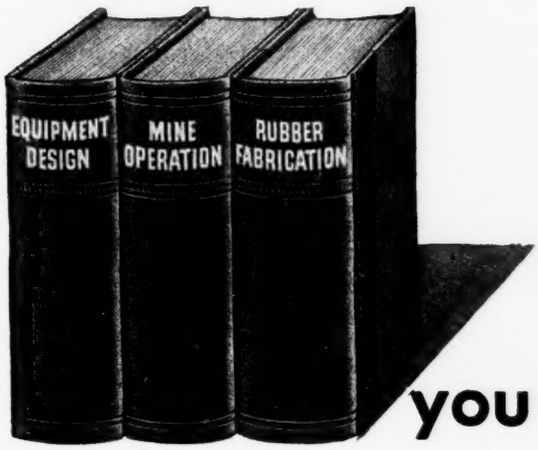

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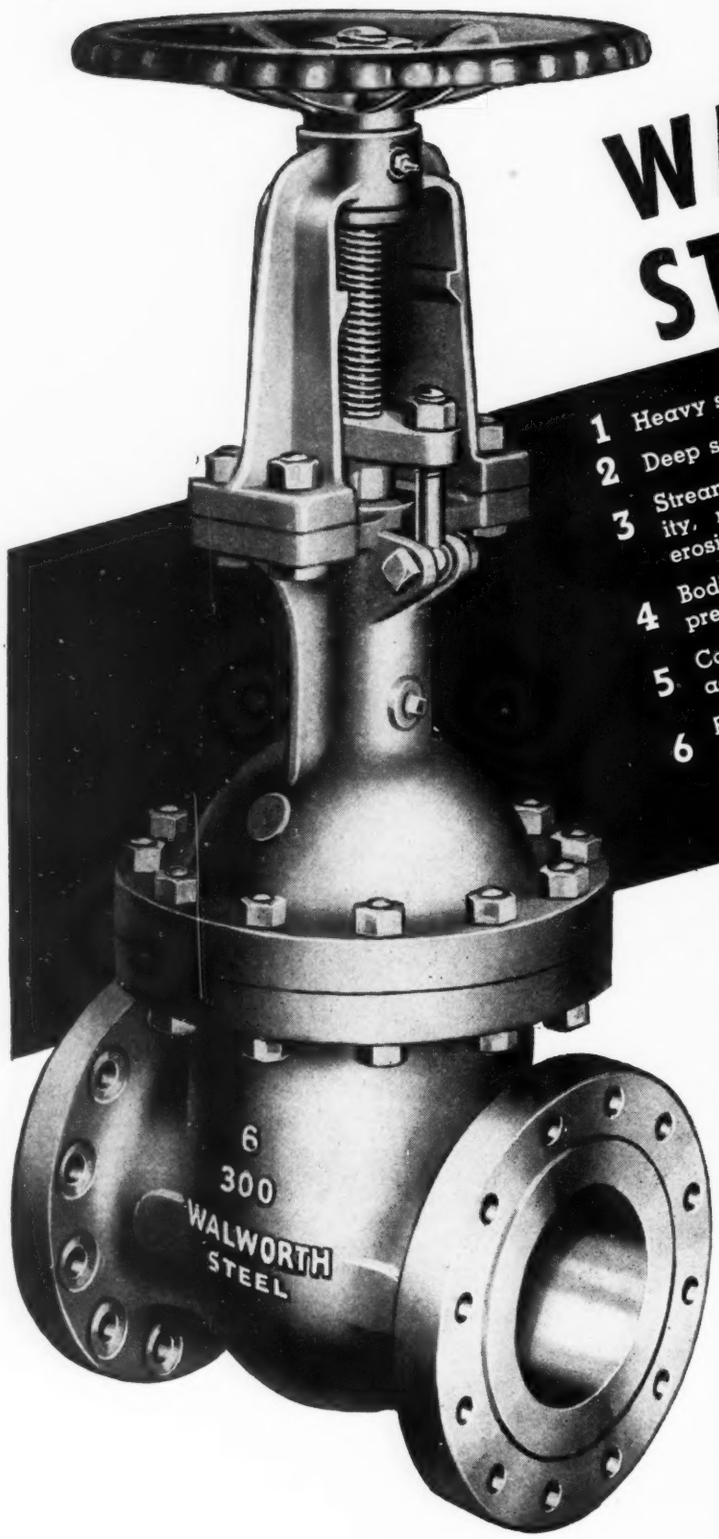

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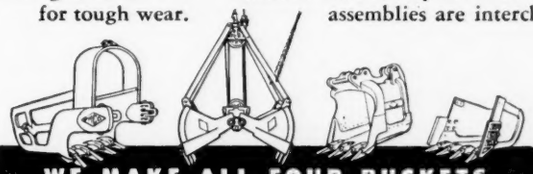

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DC SILICONES

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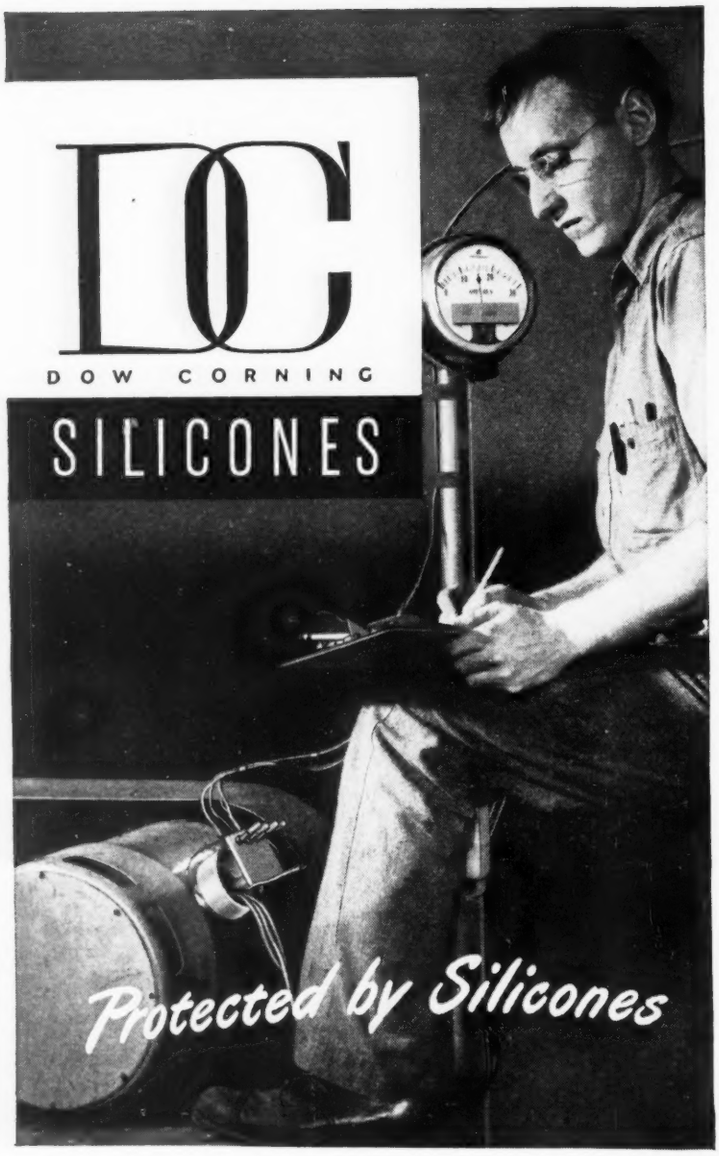

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Cross *HEAT* right off your list of electrical maintenance problems! Here's a silicone-protected motor that's going strong in an accelerated-life test already equivalent to normal operation for *an entire human lifetime!*

We took a standard 7½ h.p. Class B insulated motor and impregnated it with the new DC 996 Insulating Varnish. Then we started it running at 527° F.—*over twice the Class B temperature limit*—with intermittent 24-hour periods of 100% humidification. After 18 such cycles, including 130 hours at 527° F., the insulation still excluded moisture—still showed no decline in insulation resistance!

DC 996 means longer life, increased reliability, and added protection against overloads, high temperatures, and excessive moisture. In combination with other silicone insulating materials, it gives even greater protection. Easily applied, it cures at 300°F. For further information, write Dow Corning.

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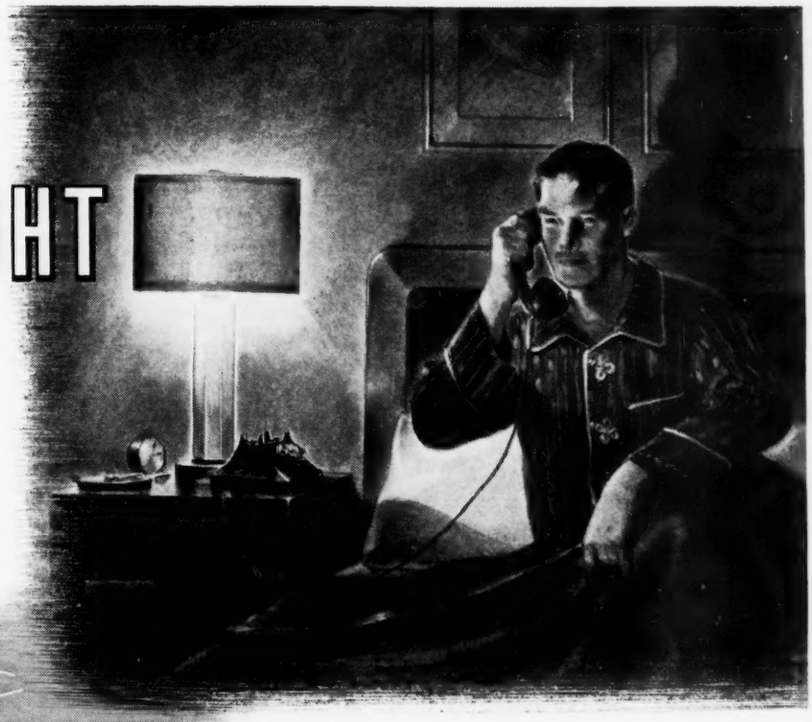
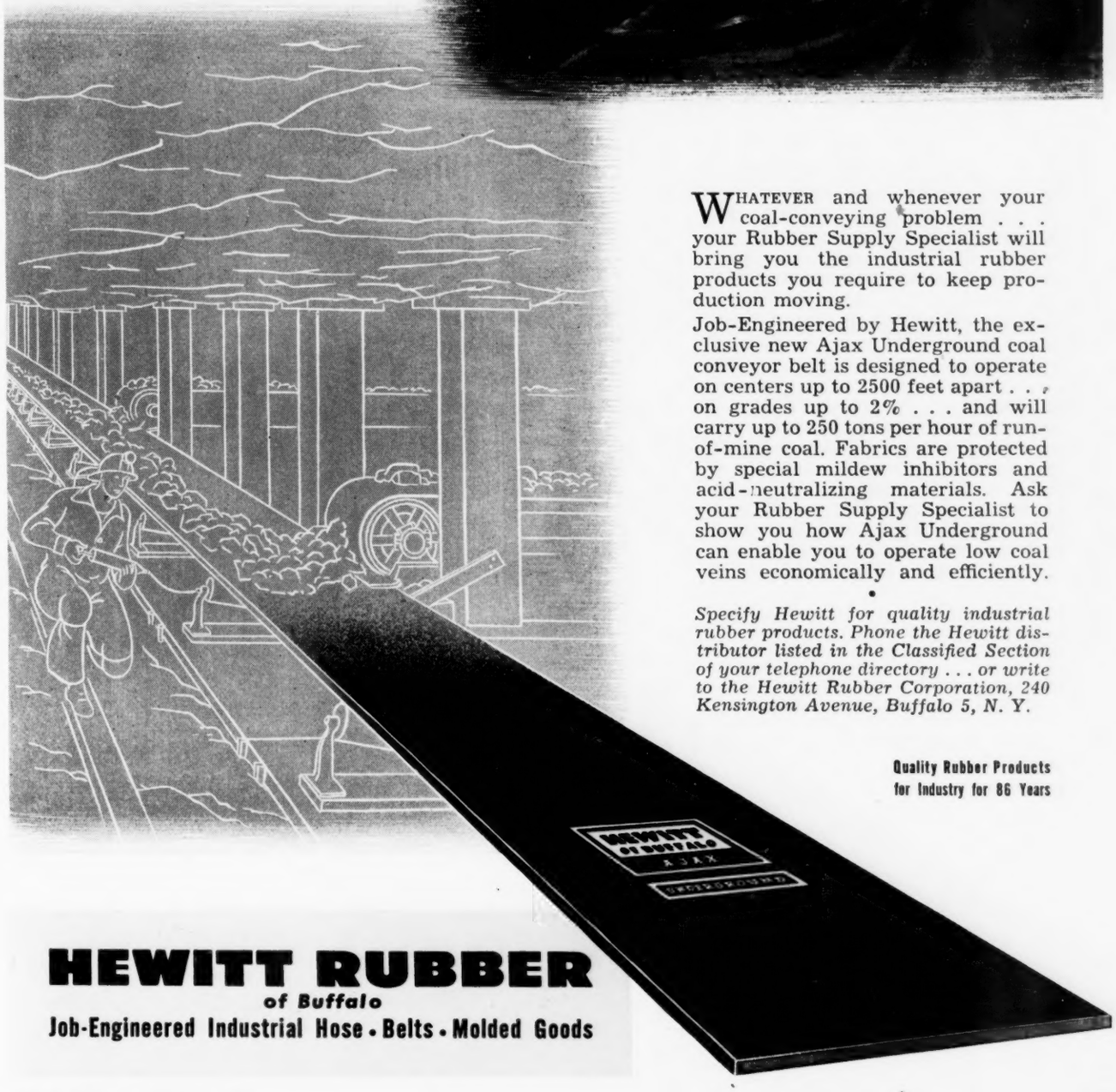


YOU CAN COUNT ON YOUR RUBBER SUPPLY SPECIALIST



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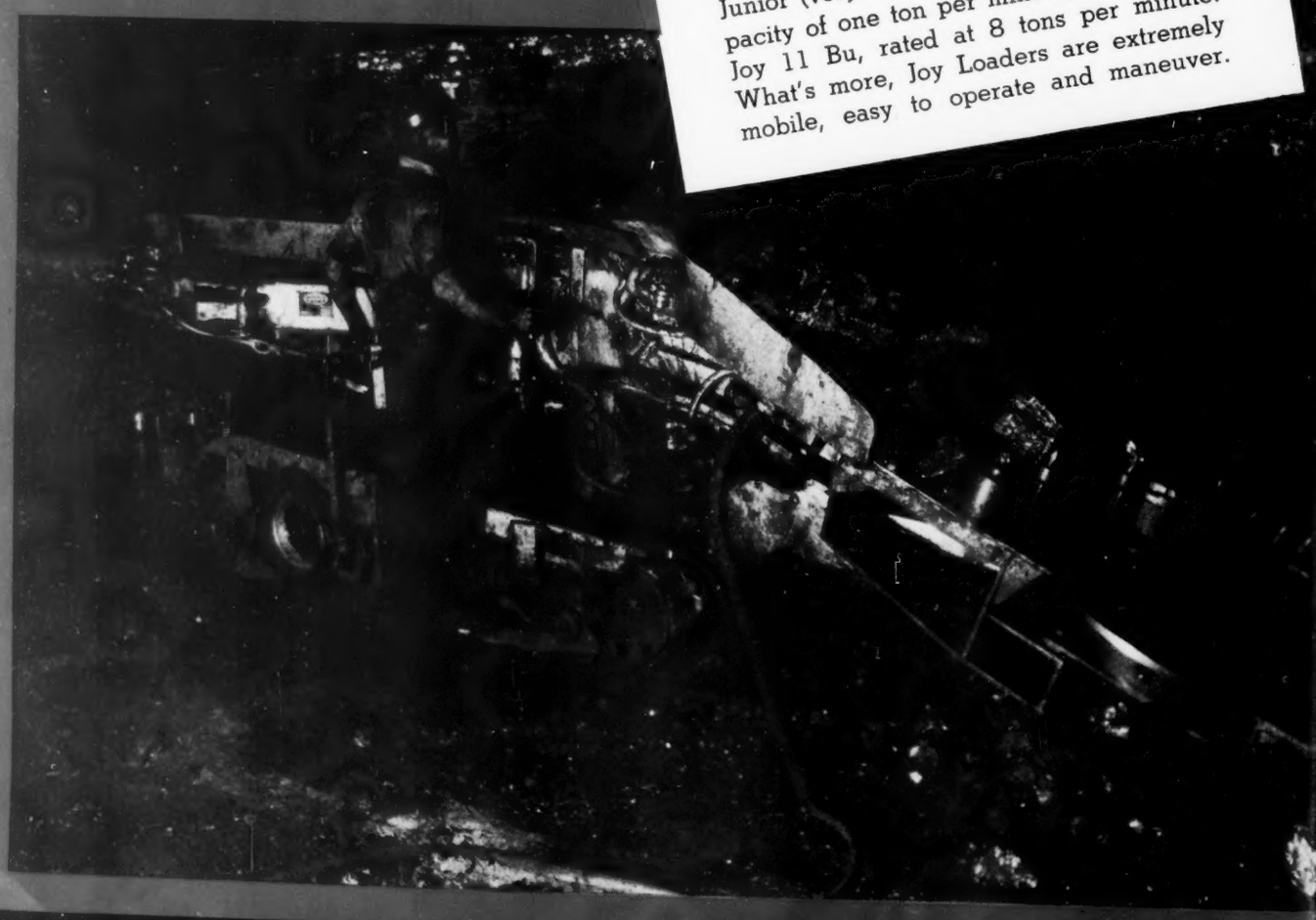

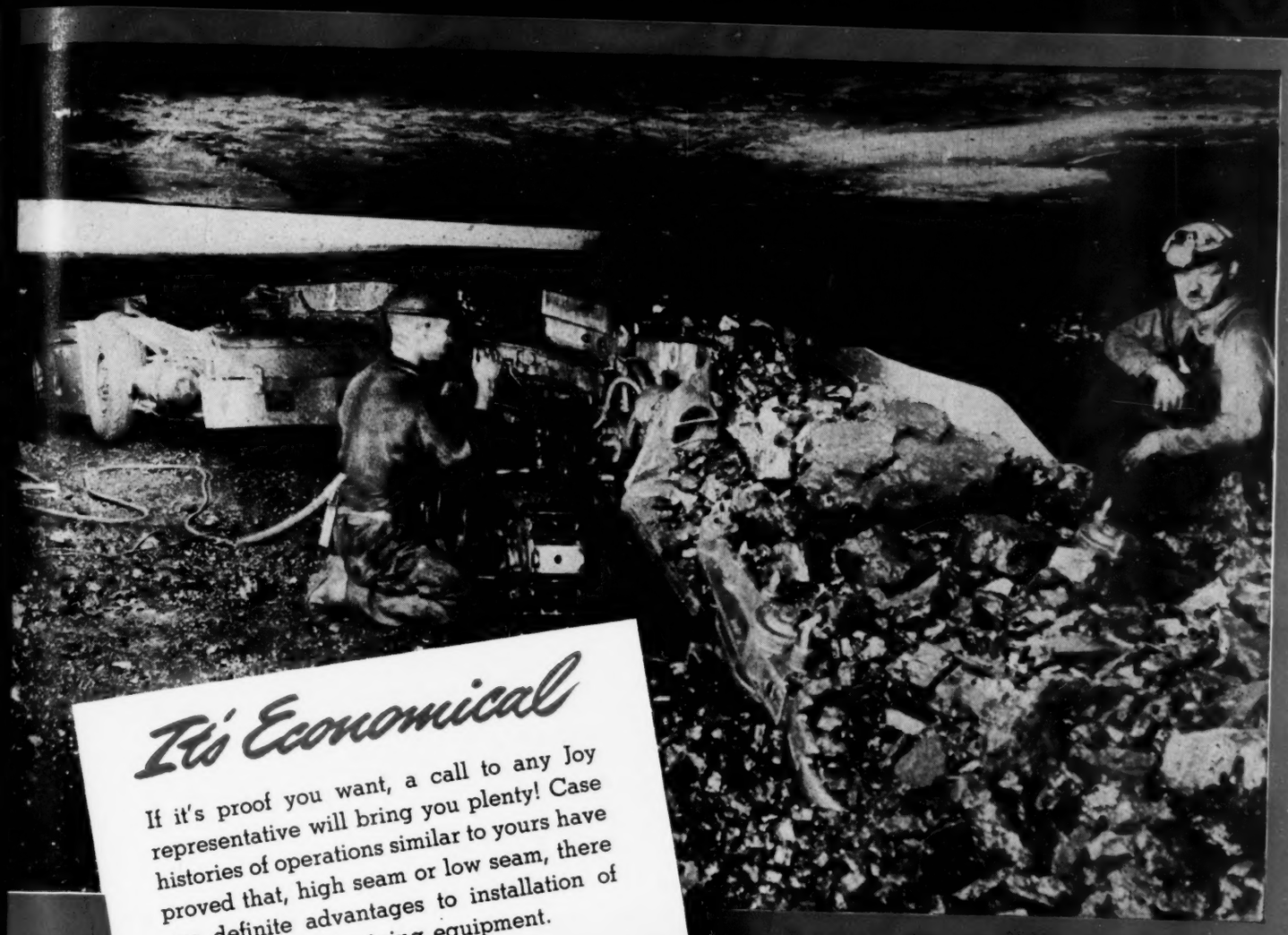

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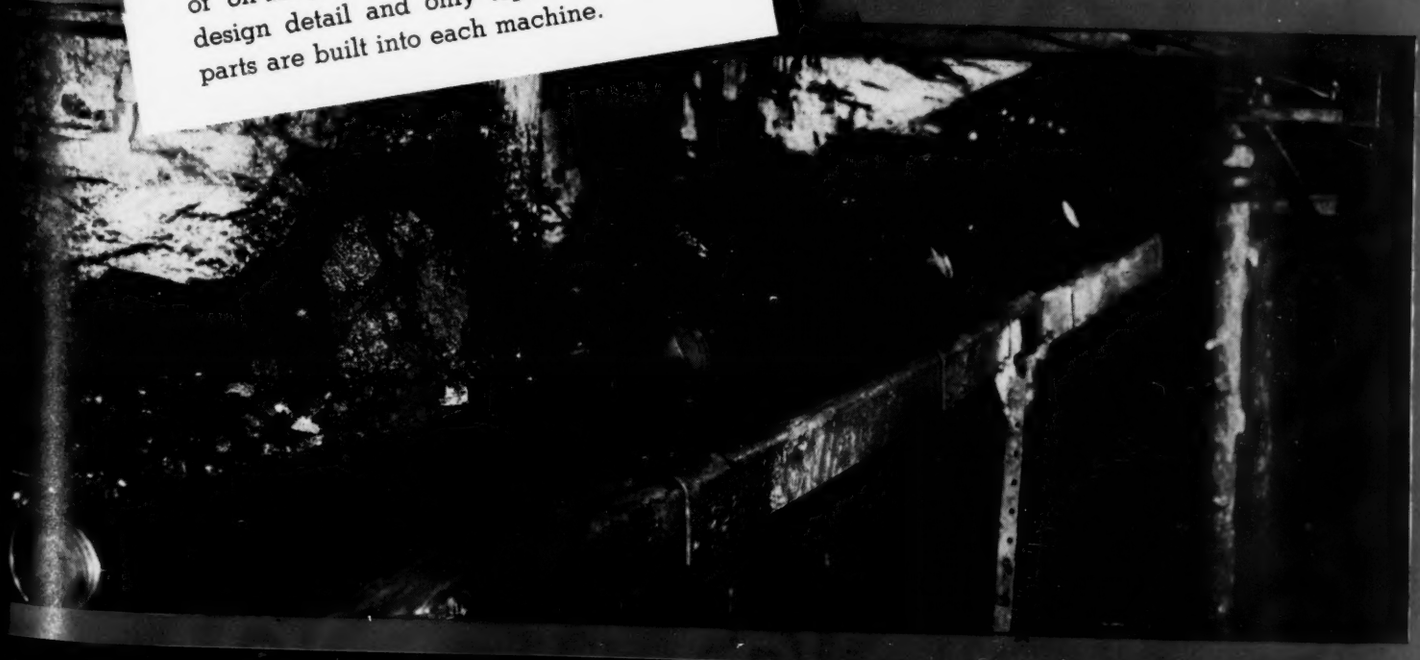

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Coal Age

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Ivan A. Given, *Editor*

JANUARY, 1946

No. 1 Ingredients

HIGHER productivity and lower cost always have been major concerns of coal men because of their close relationship to meeting and beating competition. Since the machine is the outstanding means of attaining that end, developments in machine design and especially in capacity are matters of prime concern to production men. Salesmen, although they may not be as conscious of it, also have an interest in these subjects, since the best use of modern equipment provides them with one of their most potent marketing weapons.

Increasing application of power to coal-mining operations is definitely in the cards for the future. Recent evidences of the trend are provided by such units as the power duckbill and the power bugduster. Breaking down the coal by power is being investigated more intensively and sooner or later—perhaps sooner—this investigation should result in a practical mining and loading machine. Meantime, higher-capacity loading equipment is under design or being offered, with increasing attention to new or improved loading machines to provide more of the advantages of mechanized production in thin-seam operation.

No look at future developments in mechanical-mining equipment is complete, however, without a parallel look at the way the equipment is used. In other words, operating methods should be examined and reexamined to make sure that the investment in modern equipment yields the most in increased individual productivity and decreased cost. There is a lot to be done in that direction and it remains the job of management and men. By utilizing present equipment to the best advantage and by the adoption of new and improved equipment as it becomes available, management and men can make a real contribution to mining progress.

One Goal

CONVERSION of coal into other forms of fuel offering the user convenience and cleanliness equal to or better than competitors is a project well worth the active support of the coal industry. Meantime, however, coal still will be used largely as coal. In such form, of course, it lends itself to a high degree of automatic, smokeless operation when the proper equipment is employed. However, a question that is likely to be asked with increasing frequency in the future is: What can be done to make coal in its present form a better and more efficient fuel for all types of equipment? The big answer, naturally, is better preparation. This answer, incidentally, reveals once again that sales and production departments have a greater common responsibility than might appear at first glance. The more desirable qualities the salesman is able to offer the better his chances of getting and holding the business. Since many of these qualities are affected—sometimes substantially—by preparation, the mutuality of interest becomes more clearly apparent.

What are some of the things influenced by preparation? First, there is the refuse content, consideration of which extends on to adjustment of ash qualities to meet consumer needs better. Second, there is size. Third, dustiness and similar characteristics. Fourth—and equally if not more important—is uniformity. All these and others, as has been pointed out, are susceptible to variation and adjustment in preparation. Preparation therefore becomes even more of a No. 1 job for coal mining, along with cost reduction. With the salesman or sales engineer and the preparation man working together to gage needs and provide the coal characteristics to meet them, the road to increased sales is rendered much smoother.

Well Done

WITH BITUMINOUS production promising to exceed 570,000,000 and anthracite 54,000,000 tons in 1945, the prospect of avoiding a really serious shortage of coal in the reconversion period is appreciably brighter. Some controls remain and some tight spots still exist but coal can take pride in a real job of fueling the war effort. Many of the difficulties still exist, although decreasing in magnitude. All in all, the future looks promising and in contemplation of that future coal men remember the help they received from equipment manufacturers and from the men in government charged with insuring an adequate supply of materials and equipment and an equitable distribution of the product. The return of Dr. C. J. Potter to his post in the industry again calls attention to the job done by SFAW and the Mining Equipment Division under the leadership of A. S. Knoizen, who completed his duties with WPB earlier this year. To these men, their predecessors, successors and assistants the coal industry pays tribute for real help in a time of need.

PUTTING INCENTIVE TO WORK

FOR MINING PROGRESS

- HOW INCENTIVES PROMOTE EFFICIENT MINING.
- COMPETITION AND RECOGNITION AS INCENTIVES.
- HOW MANAGEMENT CAN MAKE INCENTIVES WORK.

GREATER prosperity for the coal industry, with better earnings for miner, management and stockholder, is the fruit of higher efficiency, meaning higher productivity per man at work in mining. Management is the major key. The tools of management include modern equipment, efficient methods and promotion of cooperation between operator and employee for the benefit of each other by increasing the benefit to the public. All these tools are being employed in the battle to cut cost of production and raise quality. There are others, however, according to available evidence, that coal is not yet making full use of. One of these—and a big one—is: incentive.

What Are Incentives?

When incentive is mentioned the usual tendency is to think of increasing production, and with it efficiency, by paying on the piece basis or offering cash bonuses at less than the standard rate for extra output. This viewpoint has its roots in the fact that such incentives have been common in many industries—especially those based on manufacturing. Presumably, also, it was the theory underlying tonnage rates for hand loading and certain other operations in coal mining, although in practice, especially these days, tonnage rates are not generally regarded as incentive rates.

Certain types of so-called incentive payments, as a matter of fact, very quickly come to be considered regular wages while the basis for incentive payments may become—and often have—the source of controversy between management and men. This most often is the result of proposals for reducing incentive rates even where such proposals grow out of improvements in equipment and methods involving considerable managerial effort and substantial investment in more efficient producing facilities. This is not to imply that cash incentives do not have advantages of a major magnitude. Rather, it is an indication that where difficulties are encountered they usually are bound up with faulty understanding of what incentives are and what they can do.

Suggestions that coal mines consider incentive payments in connection with mechanical mining are being made with increasing efficiency, although available information indicates that few, if any, plans are in operation at the present time. Neither are the suggestions an indication that the mining industry should rush out and start adopting cash-incentive plans on a wholesale scale.

It is unquestionable that cash incentives could be evolved for use in coal mining in the future, despite undoubted difficulties in applying them to the conditions encountered. However, many who have studied the question ask if coal mining is ready for such plans. They base their question on the fact that management still has a major opportunity for progress through increased application of modern equipment and methods—and from other types of incentives as effective as cash payments, if not more so. Management, it is contended, still has a job to do in spite of the rapid strides it has made in recent years. After that comes the time for intensive investigation of cash incentives of the character normally thought of as aids to greater efficiency, because only then, these authorities contend, is the groundwork laid for maximum returns to both employer and employee, as well as the customer.

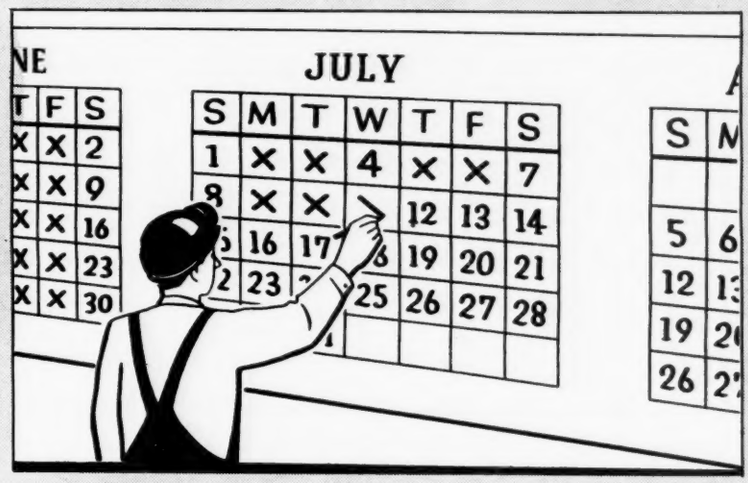
More Work, More Money

Special rates, however, are not the only avenues to cash benefits as a result of increased efficiency, especially in coal mining. Since the mind generally turns to such rates when incentives are up for consideration, there is some reason to believe that many operators—and miners—tend to overlook the possibilities for greater cash returns under the regular wage rates. To cite an example: if an increase in efficiency enables a mine to work 240 days a year instead of, say, 180, the annual income of the miner is boosted one-third, the company gets a higher return on its investment and the customer benefits through lower prices—all goals well worth working for. Or, contrariwise, where working

Human Nature Provides the Key Incentives

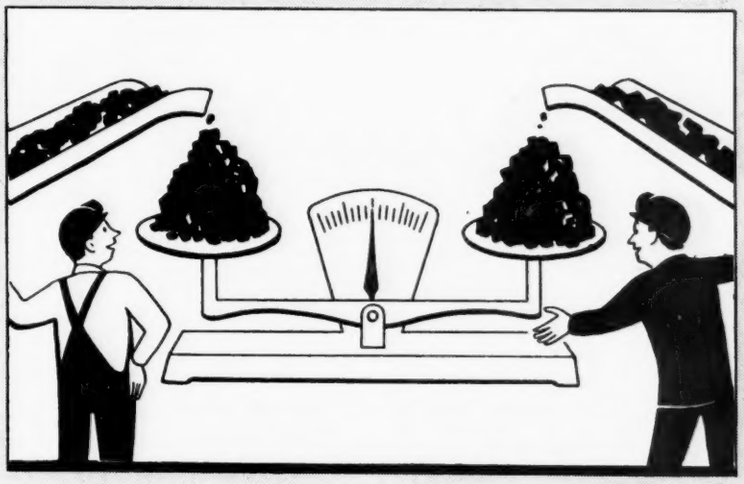
DESIRE FOR GREATER INCOME

Stimulates participation in efforts to promote efficiency and thus increase annual running time.



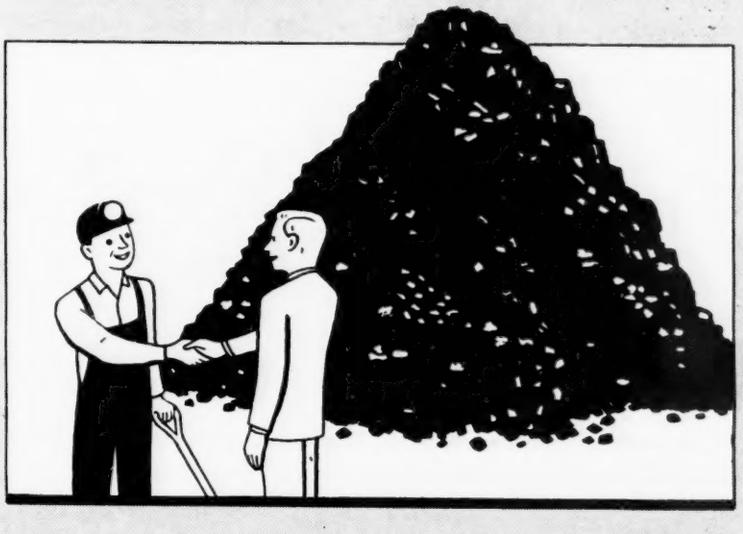
DESIRE TO EXCEL

Stimulates increased effort to maintain position as a leader or as a member of the winning team.



DESIRE FOR RECOGNITION

Stimulates increased effort to earn respect of fellow workers and supervisors.



GETTING RESULTS WITH INCENTIVES

1. Show how higher efficiency boosts working time and annual earnings.

2. Make use of the natural desire to excel by fostering healthy competition between mines, crews and individuals.

3. Keep equipment and methods up to date and eliminate bottlenecks to give competition and desire for higher earnings the best possible chance.

4. Recognize achievement and give credit where credit is due.

5. Use praise for achievement as an opportunity for imparting additional mining "know-how."

time already is good, management and men working together to raise productivity still more can prevent it from decreasing as a result of competition from within the industry or—more important—from without.

To repeat, higher efficiency means a higher annual income for miners, a better return for investors and lower prices to consumers within the regular wage set-up. That fact, if given a chance to sink in, can supply real incentive. True, it may be a little more difficult to sell, but if management paves the way by better equipment and methods and by making the facts known early and often the results should begin to show up in more tons per man and fatter pay envelopes pretty quickly.

While, as stated, cash generally is thought of—and with reason—as the most potent of incentives, there are at least two others with great powers to move men. These are:

1. The desire to excel—to be the winner or a member of the winning team.

2. The desire for recognition—for praise for a job well done.

Since the competitive spirit, otherwise the desire to excel, enters into practically every other phase of life from pitching horseshoes to running for political office, there is no reason to conclude that it is left behind when a man goes to work. Coal mining, in fact, is an industry offering a number of outstanding opportunities for putting the competitive spirit to work for the benefit of the industry and the men who make their living in it. Among other things, mines within the same regions generally have similar conditions, especially those in the same seams. In the same mine there usually is even less variation, thus removing one bar to the freer play of competition between crews and individuals. Since such competition is natural and healthy in its results, all that is necessary is to provide the climate in which it can flourish. One ingredient is a running record of achievement available to everybody concerned. The fact that it can be stated so easily should not be allowed to obscure the importance of this principle. It is a simple yet powerful incentive and one that works largely by itself.

The proper climate also involves management in its broadest sense. In other words, it goes back to such fundamentals as selection of men for crews who work well together, efficient equipment, efficient methods, good power, good maintenance, efficient transportation, the right supplies at the right place at the right time, and the best in other supporting facilities and methods, including supervision. For instance, bad power, with its attendant sluggish machine operation and frequent breakdowns, stifles the competitive spirit and breeds indifference to the benefits of higher efficiency. Or, to take another example, if the transportation system is so poorly organized as to prevent loading more than a certain number of cars in a shift, there is little use trying to take advantage of the competitive spirit because it is stopped from functioning before it starts. But with no bottlenecks to hamper them and modern, smooth-working machines under their hands, men naturally are inclined to get the most the facitities permit. When machines and methods provide the opportunity by taking off the brakes, healthy competition pays off for everybody.

Recognition Pays Off

Allied with competition and equally powerful as an incentive is recognition of accomplishment. Many managers, the evidence indicates, fail to take full advantage of this human characteristic as a means of promoting efficient operation, safety and other desirable mining goals, although the principle is finding wider application daily. Sunday schools use stars to promote more faithful attendance, the Boy Scouts stimulate interest with merit badges, and the armed services award medals for competence in military activities in addition to citations for heroism in battle. Numerous other examples could be cited but these few should indicate how recognition is employed for worth-while ends throughout a man's entire lifetime. In short, the pat on the back is one of the best methods yet found for making a man want to do better thereafter.

In many instances this pat on the back, as already pointed out, takes the form of tangible awards a man can wear on his coat or cap. Examples include the attendance buttons, chevrons and other insignia given out by mining companies during the war, as well as the white hats and other evidence of achievement embodied in a number of safety programs. There are, in addition, other equally effective methods of inspiring enthusiasm for better work. They start with a word from the boss to his crew and run the gamut of posting of records, with a word of commendation from the superintendent, personal letters from the management and other evidences of recognition. Pictures or stories about the leaders for the week, month or year in the company publication and independent newspapers in the region, along with radio mentions, where possible, have been found most effective by a growing number of com-

Incentive in Action on the Job

To stimulate production for war, mining companies found insignia for good records an effective method of stimulating interest in working more regularly. Extended into the peacetime future, the same principle of recognition of achievement supplements greater annual earnings and the desire to excel as incentives to higher efficiency in the production of coal

panies, in addition to speeches by officials at formal dinners or less formal beer-busts in honor of the elect.

What happens, however, when the man or crew fails to meet the goal that management thinks is fair? Assuming that investigation shows no error in fixing the standard and no unexpected occurrence making that goal more difficult to reach, and assuming further that the men have made an effort and accomplished something, praise still offers much the same opportunities. In other words, the benefits to be derived from stimulating enthusiasm are unchanged and in addition a golden opportunity is created for getting over suggestions as to practical methods of attaining the desired results. To sum up, recognition and praise for achievement not only stimulate a desire to do better but also establish a state of mind where suggestions for making better use of "know-how" really sink in and go to work.

Management the Key

As in practically every other activity in mining, making full use of incentives is, as indicated, mainly a matter for management from the president down to face boss. Within his own sphere, the latter can do just as effective a job of putting incentive to work by eliminating bottlenecks, publicizing records, encouraging better work and praising accomplishment as the top executive who approves the money for modern facilities, sees to acquiring the technical and managerial talent that will set the stage for its most efficient use and provides for these management men similar incentives and opportunities.

The goal in coal mining is a better, more prosperous industry and a better living for every man in it. Fuller use of natural incentives for the benefit of men, management and consumer will shorten materially the time required to reach that goal.

LOW-COST MINING

Over Many Years Goal at Robin Hood Mine

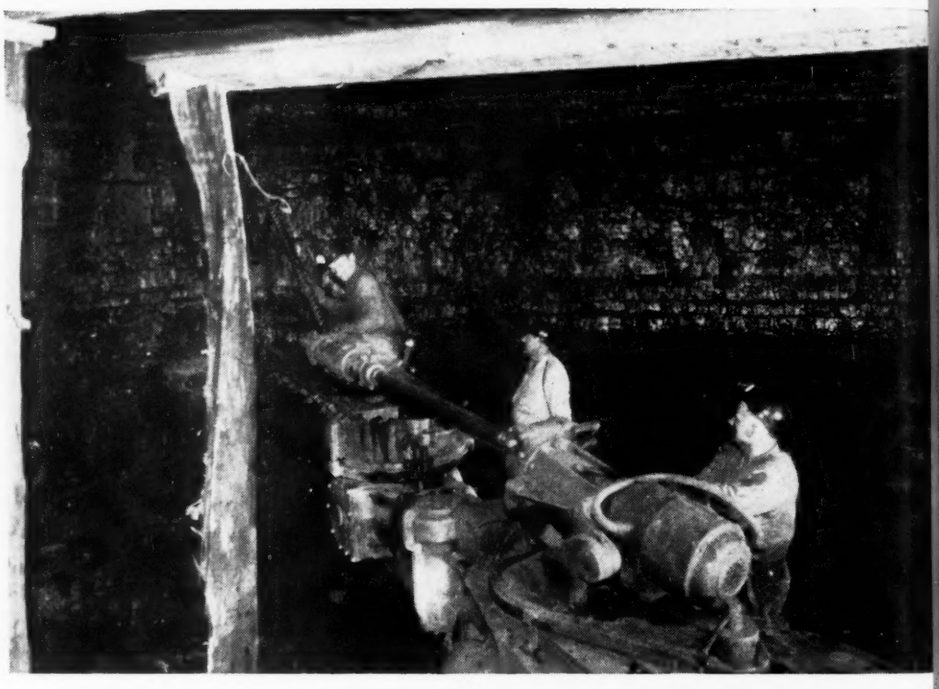
With Three Seams and 90,000,000 Tons Available, Robin Hood Aims at Permanent Low-Cost Operation and Quality—Present 12-Ft. Seam Mined With Track Equipment—Simplicity and Efficiency Feature Preparation

By J. H. EDWARDS
Associate Editor, Coal Age

PERMANENT equipment for low-cost operation has been the aim in the design and construction of the Robin Hood mine of the Princess Dorothy Coal Co., Boone County, West Virginia, which started to ship July 10, 1945, and eventually will mine over 90,000,000 tons of coal from three seams. Present mining is in a mountain-top seam, from which an 11-in. parting is cut and loaded with track-mounted equipment. Some 18 ft. of coal shows at a drift opening on one side of this thick coal acreage. A five-track steel tipple rated at 350 tons per hour has modern equipment for screening, picking, crushing and mixing.

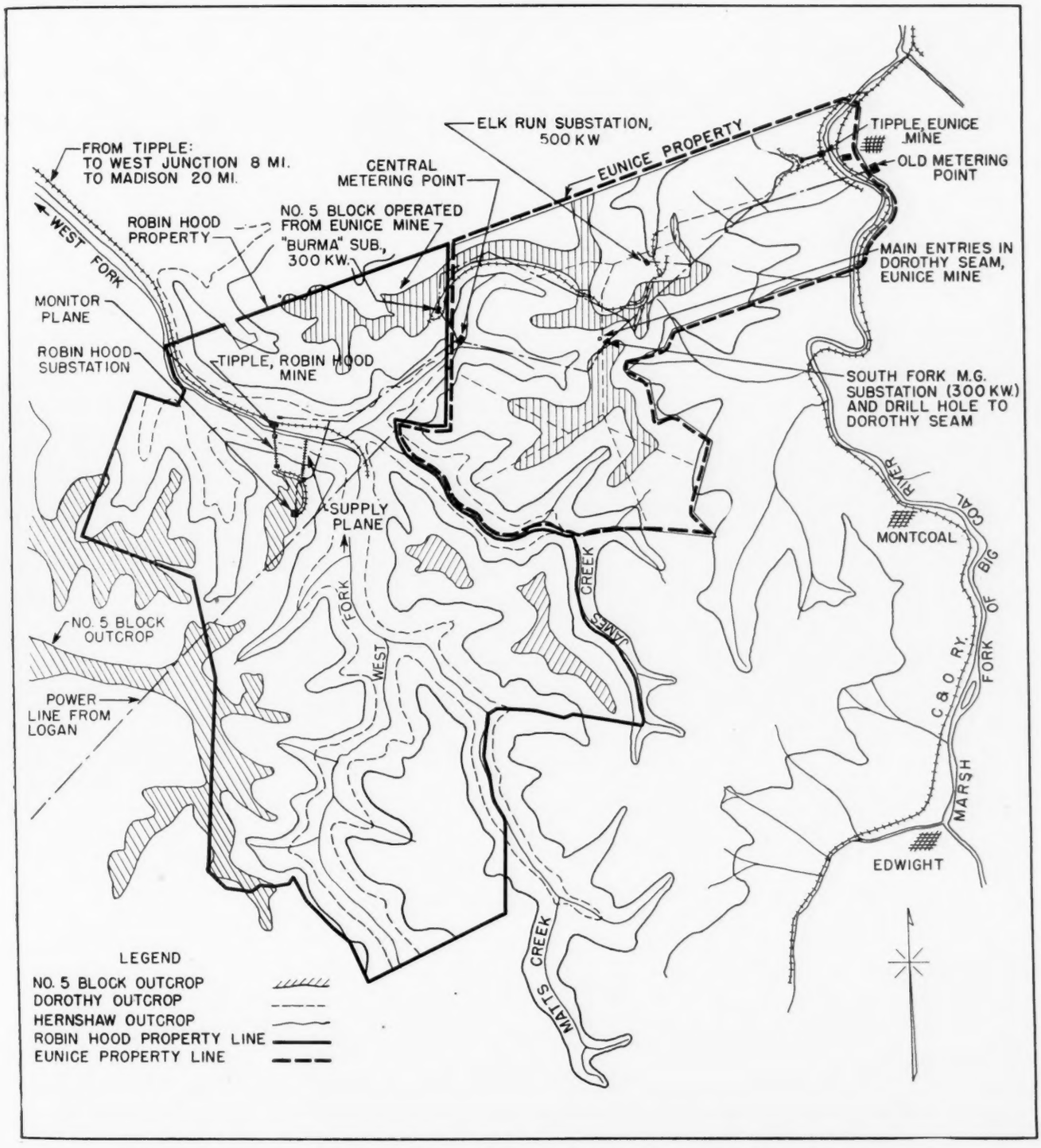
Robin Hood is at the end of a 2.6-mile extension of West Fork Branch of the Chesapeake & Ohio Ry. Twenty miles from Madison, W. Va., West Fork flows into Pond Fork at Van, and the latter and Spruce Fork form Little Coal River at Madison. The new tipple is but four miles airline from the tipple of Eunice mine, operated by the same company (Coal Age, January, 1944), and the property lines practically join. Therefore, it was found practicable and highly advantageous in operating cost to arrange for central metering of the purchased power for the two properties.

At present the highway distance between tipples is 60 miles. Lester Scholl, general superintendent of the two mines, headquartering at Eunice, W. Va., and



Cutters carry the coal drills. Here the upper bench is being drilled while the cutter bar rests in the kerf in the parting. E. A. Rippetoe, superintendent, stands in the center.

Robin Hood preparation plant. Barrel-type monitors bring the coal down from the headhouse to a 90-ton monitor dump hopper. A 48-in. belt conveyor connects tipple and dump hopper.

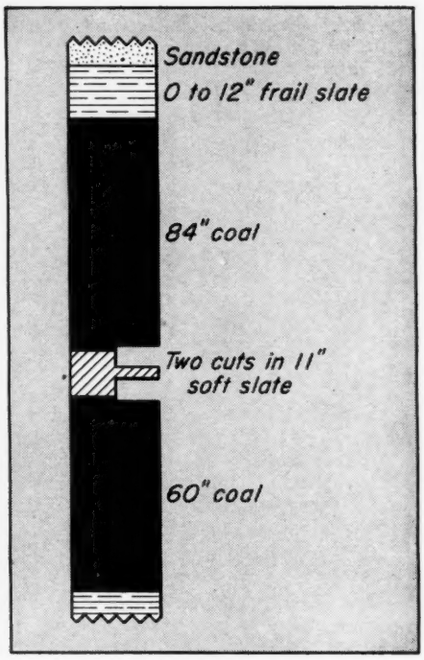


Robin Hood property and development (left) in relation to Eunice (right). Between the two is the new transformer substation and central metering point serving the two mines and cutting power cost to Eunice.

who of necessity has had to spend a lot of time at Robin Hood since construction began (brush cutting was started May 1, 1944), has found the long drive rather irksome, considering the fact that from the headhouse of the new mine he can see across the valley trips of coal traveling the "Burma Road" —an outside haulway at the back end of the Eunice property. It is a three-mile mountain hike between these points. Coal-company executives expect that the State will build a road across the hills that will serve as a short cut connecting the West Fork district with State Route No. 3, which is on Marsh Fork, the waters of which join those of West Fork at the junction of Big Coal and Little Coal rivers, 50 miles downstream and 10 miles short of St. Albans on the Kanawha River. H. D. Everett, Charleston, is president of the Princess Dorothy company and A. O'B. Hogue, Beckley, vice president and general manager.

Elevation of the railroad track at Robin Hood tipple is 1,112 ft. and of the mine rail at the headhouse 2,050 ft. The latter also is the elevation of the No. 5 Block or top seam now being mined. Its average thickness is 12 ft. and the total on the property is 12,000,000 tons. Some 375 ft. below is the

Hoisted on the cutter bar, a crossbar is held to the roof while the timbermen set legs under it. This timbering usually is successful in holding the 12-in. frail-slate top. The main roof is a strong sandstone. Test holes indicate that some of the area is without the slate.



Section of the No. 5 Block now being mined at Robin Hood, showing positions of the two cuts made to clean out the parting.

Dorothy seam, running for the most part 5 ft. in thickness but reaching 7 ft. in some places and containing 33,000,000 tons. At a level 175 ft. above the tipple railroad tracks lies the Hernshaw seam, 40 in. thick and containing 45,000,000 tons.

Coal is lowered from the No. 5 Block headhouse in barrel monitors operating on a 1,600-ft. double-track plane. It averages 32 deg. and the range of slope is 25 to 37 deg. To provide a better operating condition and avoid rope slap, design and selection of location were carried out so that at the bottom the monitors approach and land on steep track. From the monitor dump hopper to the tipple, 342 ft., the coal is conveyed across the creek and highway on a 48-in. belt. The tipple, belt conveyor, monitor installation and headhouse were designed and installed by the Kanawha Mfg. Co.

The tipple has the conventional balanced double-section main screen and apron-type loading booms. Flat sections on the lump and stove booms serve as picking tables. Two-inch nut-and-slack from the main screen feeds by gravity to an Allis-Chalmers 5x12-ft. Low-Head vibrating screen that makes 2x1¼-in. nut and 1¼x0-in. slack. Rescreens are built into the lump, stove and egg booms to remove final degradation.

A mixing conveyor and Jeffrey 26x36-in. single-roll crusher are installed under

With the coal shot down, a loading machine is digging into the fall. Average seam thickness in this area is 11 ft.

Not including two partings, 18 ft. of coal shows at this point, where grading is under way for an entry.

The five-track steel tipple serving Robin Hood has modern equipment for screening, picking, crushing, mixing and loading.

Below, a view of the empty yard from a window in the tipple. Princess Dorothy officials credit the Chesapeake & Ohio Ry. with an outstanding job of grading and track work.

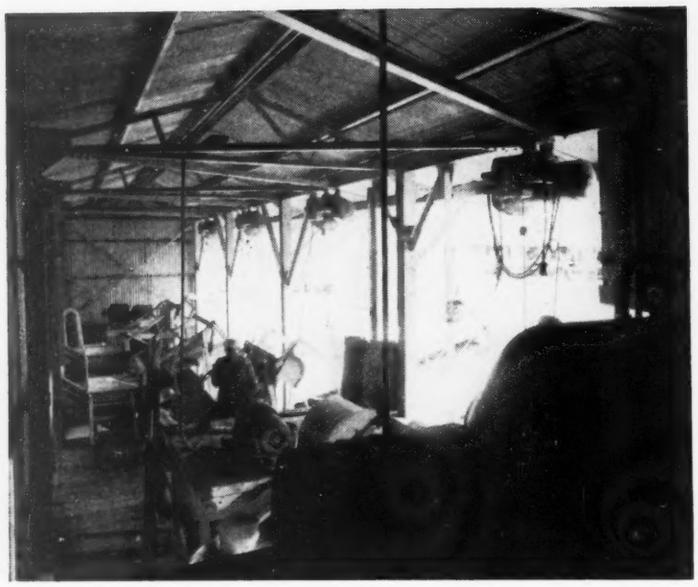
a separate roof at the ends of the booms. The crusher is between the upper and lower runs of the mixing conveyor. Another conveyor, also of the scraper type, recirculates the crushed material back to the feed of the main screen. Another Jeffrey 18-in. single-roll crusher, into which the pickers toss lumps of the "soft" coal that would likely be broken in transit, is installed between the two picking tables. Simplicity is a feature of the plant. There are but three other conveyors besides those already mentioned. One is a 24-in. belt unit from the screen room to the mixing conveyor, and the others are flight or scraper installations for conveying crushed soft coal, refuse and house coal.

All motors are 440-volt General Electric Type KG totally inclosed fan-cooled units. Except for three or four V-belts, the speed reduction transmissions are Falk Motoreducers. Boom hoists are Yale. The 48-in. belt for the main conveyor from monitor dump bin to tipple was made by Goodyear, and the idlers were made by Link-Belt. The feeder to that belt, instead of being driven by an individual motor, is chain-driven from the belt tail pulley, saving the expense of a motor and a power line to that point.

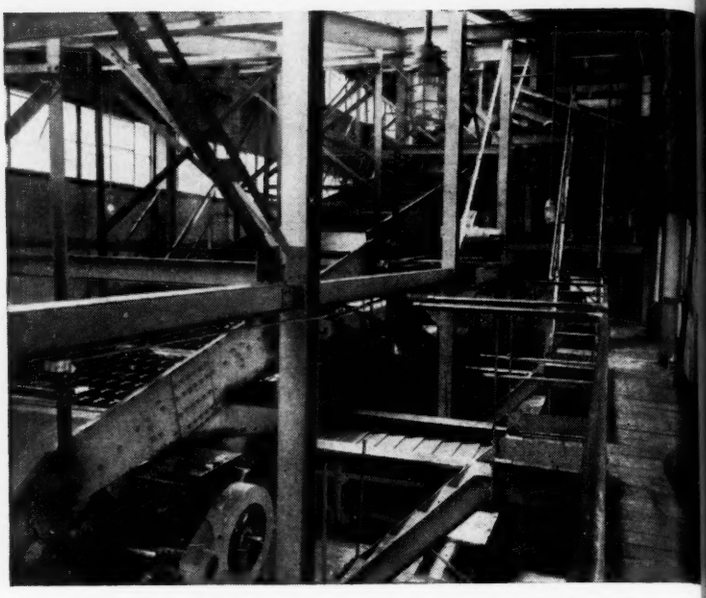
Of the 20 motors in the tipple the largest is a 100-hp. unit on the crusher. The total connected load is 235 hp. The 440-volt incoming line, in rigid conduit like all other light and power wiring in the tipple, feeds through a General Electric air-circuit breaker to an inclosed central control cabinet consisting of nested Trumbull Utility circuit breakers. Three 75-kva. Westinghouse Hipersil Type CPS single-phase transformers reduce voltage from 4,160 to 440 for the tipple load. These are installed on a ground foundation within 75 ft. of the tipple and with them is a 60-kva. Cornell-Dubilier capacitor for power-factor correction. Empty and loaded tracks above and below the tipple accommodate 80 cars each.

The barrel monitors, which have lift endgates for dumping, weigh 10 tons

Monitor being loaded at the headhouse through a motor-driven undercut grate. The "Burma Road" is just visible in the upper background.



Looking across the 100-hp. crusher motor at the four boom hoists in the tipple. The mixing conveyor, which circles the crusher, extends to the left. A separate structure houses these units.



At the left and partially under the main screen is the crusher into which men on the two picking tables throw the soft coal. Behind the motor in the center is a low-head vibrating screen.

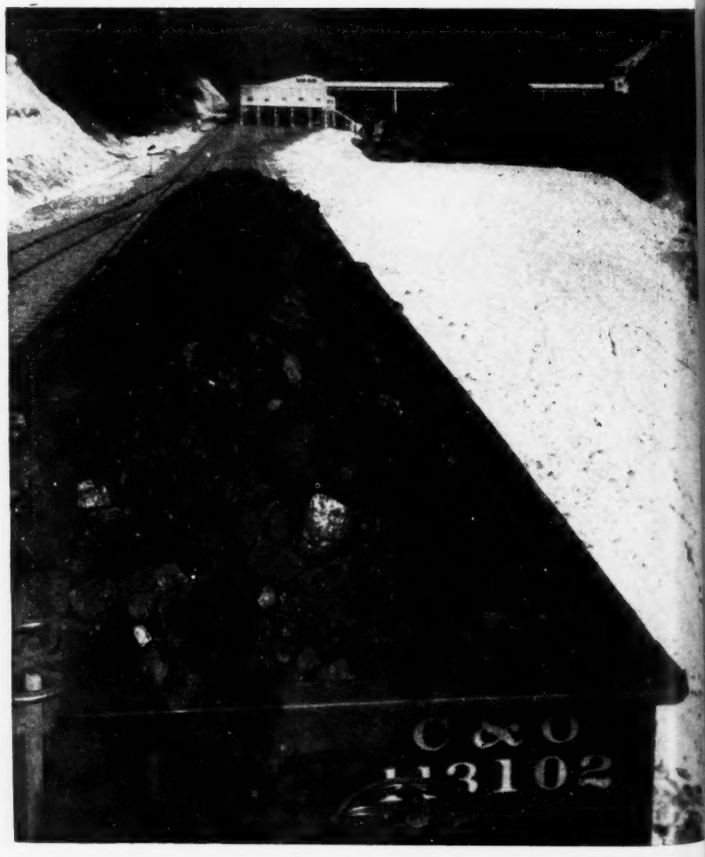
each and carry 15-ton loads. Gage is 56½ in., rail weight is 70 lb. and the ties are 7x9-in.x8-ft. oak pressure-treated with chromated zinc chloride. Ropes are 1⅜-in. Tru-Lay made by the American Chain & Cable Co., and the drum, which is of riveted structural construction, is 12 ft. in diameter over the 5-in. (thick) oak lagging. This drum is mounted on a 10-in. shaft. The braking is being done temporarily with plain steel bands on cast-iron brake-drum segments. Foundations are installed awaiting delivery of a Parkersburg Rig & Reel Co. Hydrotarder. Connected to the drum shaft, the Hydrotarder will provide smooth control of the monitors and practically eliminate brake-band maintenance. The first of these fluid-type governors and brakes was successfully applied to coal-mine lowering planes and man-and-material inclines several years ago (*Coal Age*, August, 1941).

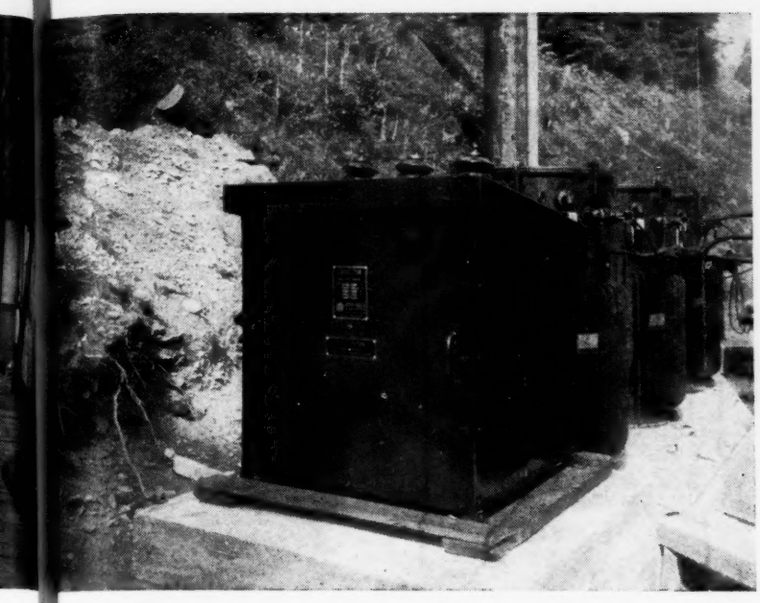
Monitors are loaded through motor-driven undercut gates and the two motors on this duty are the only ones in the headhouse. Drop-bottom mine cars are used and the dump hopper holds 150 tons. Capacity of the dump hopper at the bottom of the incline is 125 tons.

Mine-track gage is 42 in. Car equipment consists of 52 all-steel American Car & Foundry Co. cars carrying 7 tons each, machine loaded. They have Timken bearings, are without brakes and are 47 in. high, including 6-in. steel sideboards. Sideboards were specified so that car height can be reduced at some

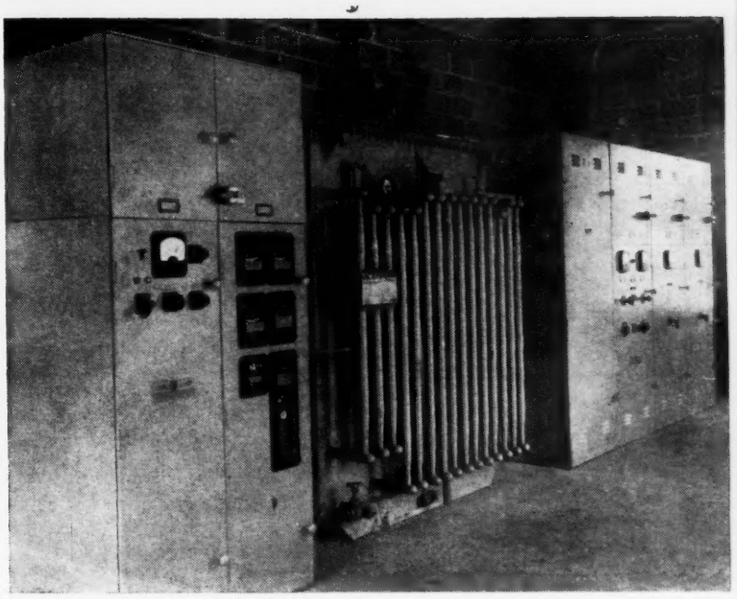
Track construction involves steel ties bolted to wood ties pressure-treated with chromated zinc chloride.

Some of the first No. 5 Block coal loaded by the new Princess Dorothy Robin Hood plant, Boone County, West Virginia.





Three transformers supplemented by a capacitor for power-factor correction serve the tipple.



D.c. at 275 volts is supplied Robin Hood by this ignitron rectifier. The sealed tubes are in the cabinet at the right.

later date when they may be moved into the Dorothy seam. A special feature of the cars, put on at the request of the coal company, consists of cross straps at the ends near each corner to facilitate rerailing. Permanent tracks are on composite ties made by bolting West Virginia Steel & Mfg. Co. 50-lb. steel ties to 5x5-in.x6-ft. wood ties treated by the same method as the monitor plane ties.

Three of the main-haulage track switches have been equipped with Electri-Throws made by the American Mine Door Co. Trolley wires are 400,000-cir.mil No. 9 section and the line materials are Westinghouse.

Although the mine is 100 percent mechanical loading, a 12½-ton Toledo Printweight Automatic scale was installed on the loaded track approaching the dump in the headhouse. The scale was installed so that per-ton mining costs can be figured immediately and also to check any tendency toward light loading of cars, which sometimes occurs when crews compete in number of mine cars loaded per shift.

Thickness of the No. 5 Block seam in the openings now being mined is 12 ft. 11 in., including a soft slate parting 11 in. thick and 60 in. from the bottom. In this area the top is 12 in. of frail slate under a strong sandstone. However, core drilling over the property showed that the frail slate is missing in many places.

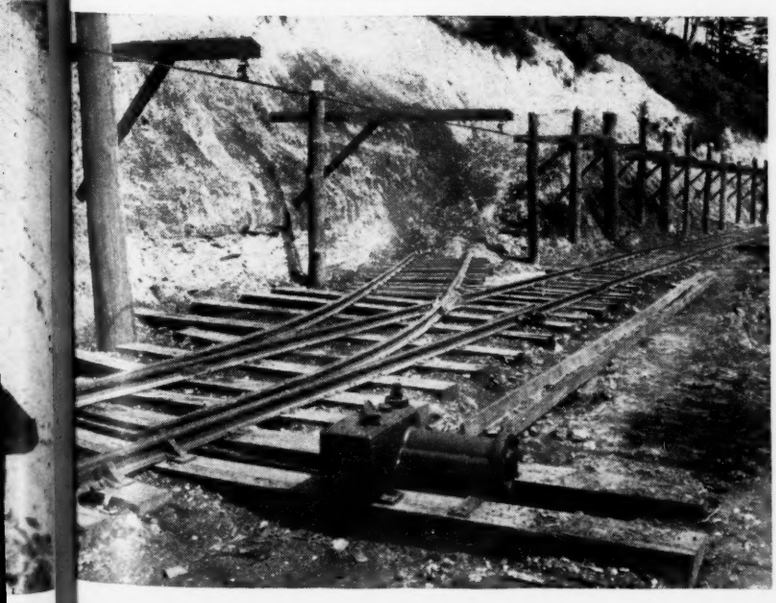
Present equipment consists of one Goodman No. 360 track-mounted loader, two Whaley Automats, two Sullivan 7AU track-mounted cutting and shearing machines with coal drills mounted on them, two 8-ton Jeffrey cable-reel locomotives and one 6-ton Jeffrey cable-reel locomotive.

The parting is cut out with the 7AU's and the procedure is to make a cut in the bottom of the parting including about 1 in. of coal, then another cut in the top, also including about 1 in. of coal, and then, with a few rapid sweeps of the cutter-bar, rake out the remainder of the material. After the loading machine loads the parting material into the 7-ton cars, both benches of coal are broken down with Cardox.

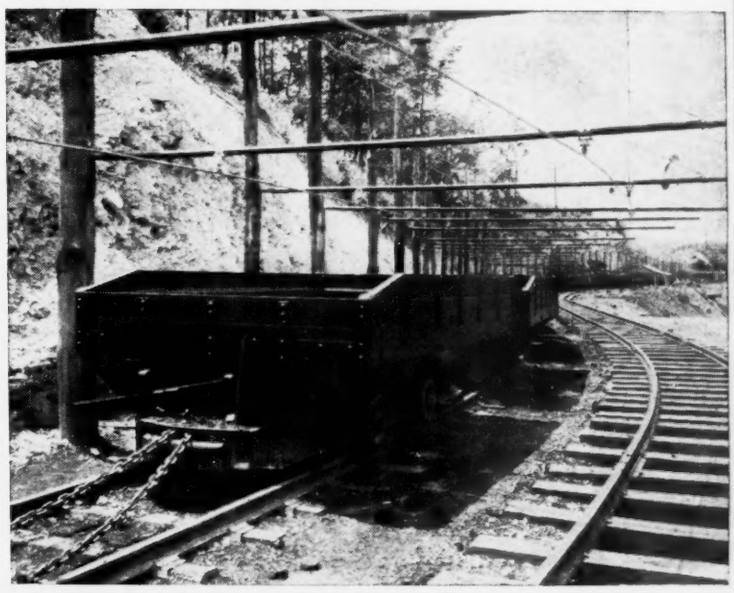
Direct current at 275 volts is supplied by a rectifier installed in a 20x36-ft. cinder-block and steel building at a drift opening 4,000 ft. from the headhouse. This 300-kw. sealed-tube unit, made by General Electric, is completely inclosed in steel cabinets. The 3- to 6-phase transformer is of the Pyranol type and is installed indoors between the two cabinets. Tubes are arranged in banks of three, one above the other, in the ends of the cabinet containing the d.c. switching apparatus. A Cornell-Dubilier 120-kva. 4,160-volt capacitor for power-factor correction is installed outside.

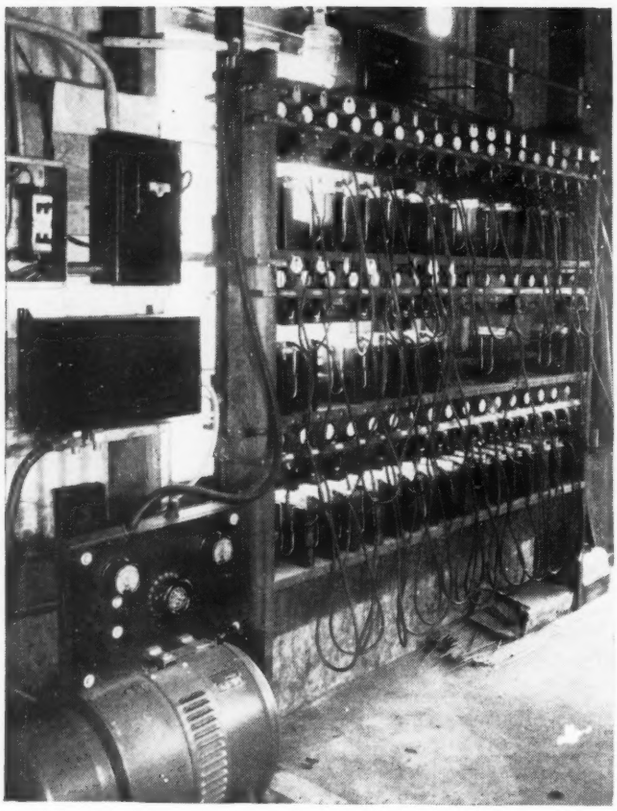
Charging racks for the mine lamps

One of the electric switchthrowers on the tramroad. An entry will be driven into the outcrop at this point.

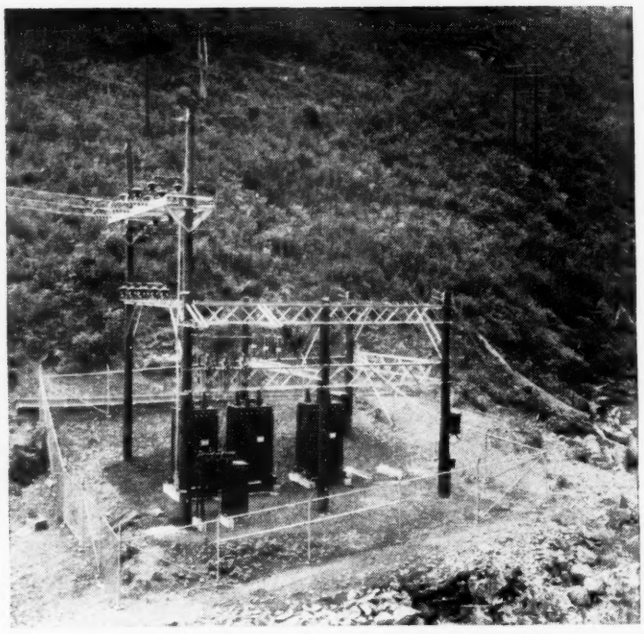


Some of the 52 new 7-ton drop-bottom cars, ordered with removable sideboards. Cross straps on the ends are for rerailing.





Fifty-one cap lamps comprise the present installation.



The power company's new central substation and metering point for Robin Hood and Eunice mines. The voltage is reduced from 45,100 to 4,160. The capacity is 2,250 kva. Both mines benefit by increased demand diversity and transferring the energy charges to the lower brackets.

are in a lamphouse near the top of the man-and-supply incline. Wheat lamps are used and the number now on hand is 51. The hoist operator takes care of the charging and watering of these lamps. The hoist, made by the Thomas Hoist Co., Chicago, is a single-rope clutch-type unit powered by a General Electric 200-hp. 870-r.p.m. 440-volt wound-rotor motor.

The new transformer substation and central metering point for the Robin Hood and Eunice mines is 1½ miles from the Robin Hood tipple and 2,000 ft. from the nearest Eunice d.c. substation. By building that 2,000-ft. line and another 3,800-ft. line to another Eunice substation the Eunice property was given a loop feeder. Whereas the old transformer and metering point at Eunice (located near the tipple) was fed from the Cabin Creek power plant of the Appalachian Power Co., the load of both mines is now on the Logan generating plant. The power company cooperated heartily in the change.

Four houses have been built for mine officials. All have five rooms on the ground floor. The two nearest the camera also have two small bedrooms on the second floor.

Houses Built for Officials

Four houses for mine officials have been built in a side hollow about three-quarters of a mile from the Robin Hood tipple. All have basements and the ground floors have five rooms, including baths. Two of them have, in addition, two small bedrooms on the second floors. Heating plants are coal-fired hot-air furnaces. Water is supplied from a high tank and sewage is taken care of by a central septic tank.

Charles Vawter has been engineer on the Robin Hood job since the beginning of planning. E. A. Rippetoe is superintendent. Production has been started at about 1,000 tons per day. The sales agent for the coal is the Smokeless Fuel Co., Charleston, of which Mr. Everett also is president. Other officers of the Princess Dorothy Coal Co. are L. Epperly, vice president, and Howard W. Ball, secretary-treasurer.

BETTER TRACK

Through Turnouts as Transition Elements

How to Use "Center-Line-Value" Calculations to Get Better Track Layouts — Straight Frog and Switch Turnouts Considered as Transition Elements to Lateral Curves From Main and Secondary Tracks

By NORMAN B. GURLEY
Civil and Mining Engineer
Huntington, W. Va.

"WHERE do we set the frog?" might equally well be the title of this article. It is a question that often confronts mine and industrial-plant operating and engineering offices when the objective is the best possible track. In this article I am attempting to approach it by considering turnouts as transition elements, thus borrowing from the calculation procedure for the railway spiral. The methods that will be suggested eliminate rough graphical solutions, which often are disappointingly inaccurate. It also will be noted that they are the key to more intricate track layouts, such as wyes and the like.

The information in this article has been prepared primarily for the use of engineers charged with laying out and installing trackwork and therefore assumes a working knowledge on the part of the user of the fundamentals thereof and the mathematics of circular curves. Only turnouts made up of straight frogs and switches are considered, since, because they may be laid either right or left and to a considerable extent are stock items with the manufacturers, they tend to wider use and availability, as well as to greater ease of replacement.

The "center-line-value" calculation methods given herein are accurate and universally applicable irrespective of frog members or curve radii and, it is hoped, will be found useful in standardizing track-layout procedure. They are applicable *only* to turnouts from *straight* track.

For convenience in calculating, and for practical considerations in laying out in the field, *all the dimensions* incorporated in the formulas hereafter given are expressed in *feet and/or decimals thereof*. All manufacturers' information, including track gage, should be reduced accordingly. It is suggested that when dealing with short-radius turnouts the user have in addition to the appropriate manufacturers' trackwork catalogs a copy of "American Recommended Practices—Frogs, Switches and Turnouts for Coal-Mine Tracks," published by the American Mining Congress, Washington, D. C., under date of July, 1936.

Where no special considerations are involved, a good track installation will present, as nearly as possible, a uniform radius of curvature through the turnout itself and the subjoined lateral curve. To this end, attention is called to the following facts:

For any straight frog and switch turnout, one theoretical or "replacement" radius and only one can be drawn joining the principal and frog tangents, which also will be tangent to the latter at a predetermined distance beyond the heel of the frog.

This theoretical or "replacement" radius always exceeds and therefore is inappropriate to the center-line radius of the curved portion of the turnout under consideration. For proof of the foregoing statement, two examples are given below, with basic data from Cols. 2, 3, 5, 6, 13 and 16 of Table I:

No. 2 Turnout, 42-In. gage

Selected radius..... 20.00 ft.

Theoretical Radius:

8.86xCot. 14 deg. 2 min. ... 35.45 ft.
417 ÷ Vers. 28 deg. 4 min. 35.46 ft.

No. 5 Turnout, 42-In. Gage

Selected radius..... 150.00 ft.

Theoretical Radius:

22.50xCot. 5 deg. 42½ min. . 225.09 ft.
4.45 ÷ Vers. 11 deg. 25 min. 224.91 ft.

Hence, if an arc of the lesser and appropriate radius, with a central angle equal to the frog angle, be drawn to satisfy the desired conditions adjacent to the heel of the frog, this arc will terminate in a tangent parallel to the principal center line and offset a determinate distance on the turnout side. This offset, hereafter referred to as the "shift," together with location in the parallel tangent of the point of curve of the appropriate radius, is determined by a later given method of comparison of rectangular coordinates.

If the circular curve that adjoins the turnout is *not shifted* (i.e., is drawn tangent to the principal center line) a sharper turnout must be used. Some examples are:

Selected Center Radius	Appropriate Frog If Shifted	Resultant Frog If Curve Is Not Shifted
25 ft.	No. 2	Impracticable
60 ft.	No. 3½ or 3	No. 2½ or 2, any gage
100 ft.	No. 4½ or 4	No. 3½ or 3, any gage
150 ft.	No. 6 or 5	No. 4, 36- or 42-in. gage, no wider; or No. 3½, any gage

The test and/or proof of this statement is as follows:

If $\frac{\text{R. vers. Frog Angle}}{\text{Sine Frog Angle}}$

is exceeded by
Ga. x Frog No.+Theo. Pt. Len.+1 ft., the turnout cannot be installed tangent to an unshifted curve of that radius.

Selecting the Turnout

After selecting the radius of the circular curve to be used, proceed as follows:

1. Choose from a manufacturer's catalog a straight frog and switch turnout of the proper gage and rail weight the center-line radius of the curved portion of which most nearly corresponds to the radius of the selected curve.

2. Calculate the distance along the center line of the frog tangent from its intersection with the principal tangent (hereinafter called the "frog P.I.") to a point 1 ft. beyond the heel of the frog, as follows:

Multiply track gage expressed in feet and decimals by the frog number chosen in accordance with Item 1. To this add the distance from the theoretical point of frog to the heel thereof as determined

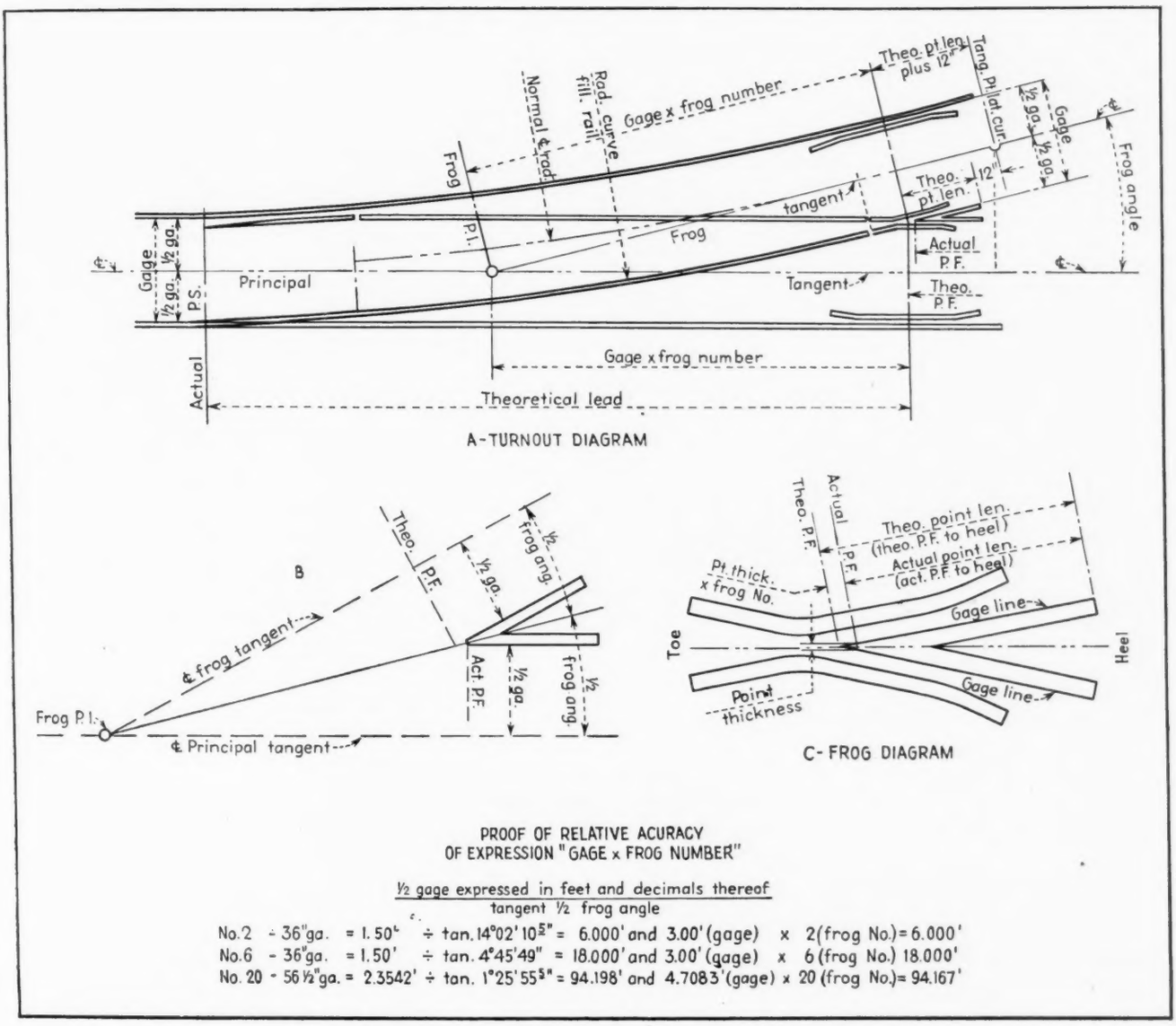
Table I—Calculations Relating to Typical Straight Frog and Switch Turnouts

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Source of data	Selected radius	Ga.	Rail wt.	Frog No. and type	Frog angle	Actual pt. len.	Frog pt. thick-ness	Theo. pt. to heel	Col. 9 +12″	Frog P.I. to Theo. P.F.	Total cols. 10 & 11	X_t	X_c	$X_t - X_c$ = "shift"	Y_t	Y_c	$Y_c - Y_t$ = "Pull back"
1	A.M.C.	16′	36″	20#	2 cast	28° 04′	8 1/4″	1/4″	8 3/4″	1.73	6.00	7.73	3.64	1.88	1.76	6.82	7.53	0.71
	A.M.C.	20′	42″	30#	2 cast	28° 04′	9 13/16″	1/4″	10 5/16″	1.86	7.00	8.86	4.17	2.35	1.82	7.82	9.41	1.59
	A.M.C.	20′	44″	40#	2 cast	28° 04′	10 13/16″	1/4″	11 5/16″	1.94	7.33	9.27	4.36	2.35	2.01	8.18	9.41	1.23
	A.M.C.	25′	48″	40#	2 cast	28° 04′	10 13/16″	1/4″	11 5/16″	1.94	8.00	9.94	4.68	2.94	1.74	8.77	11.76	2.99
2	W.Va. S.&M.	50′	36″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 3/4″	4.70	10.50	15.20	4.25	2.00	2.25	14.59	13.99	−0.60
	W.Va. S.&M.	50′	42″	60#	3 R. Pl.	18° 55′	3′ 3″	1/2″	3′ 4 1/2″	4.40	10.50	14.90	4.83	2.70	2.13	14.10	16.21	2.11
	W.Va. S.&M.	50′	44″	60#	3 R. Pl.	18° 55′	3′ 3″	1/2″	3′ 4 1/2″	4.40	11.00	15.40	4.99	2.70	2.29	14.57	16.21	1.64
	W.Va. S.&M.	50′	48″	60#	3 R. Pl.	18° 55′	3′ 3″	1/2″	3′ 4 1/2″	4.40	12.00	16.40	5.32	2.70	2.62	14.51	16.21	0.70
3	W.Va. S.&M.	60′	36″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 1/4″	4.70	10.50	15.20	4.25	2.40	1.85	14.59	16.79	2.20
	W.Va. S.&M.	60′	42″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 1/4″	4.70	12.25	16.95	4.74	2.40	2.34	16.27	16.79	0.52
	W.Va. S.&M.	60′	44″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 1/4″	4.70	12.83	17.53	4.91	2.40	2.51	16.83	16.79	−0.04
	A.M.C.	60′	48″	40#–60#	3 R. Pl.	18° 55′	3′ 0″	3/8″	3′ 1 1/8″	4.09	12.00	16.09	5.22	3.24	1.98	15.22	19.45	4.23
4	W.Va. S.&M.	75′	36″	60#	4 R. Pl.	14° 15′	3′ 6″	1/2″	3′ 8″	4.70	12.00	16.70	4.11	2.31	1.80	16.19	18.46	2.27
	W.Va. S.&M.	75′	42″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 3/4″	4.70	12.25	16.95	4.74	3.00	1.74	16.27	20.99	4.72
	W.Va. S.&M.	75′	44″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 3/4″	4.70	12.83	17.53	4.91	3.00	1.91	16.83	20.99	4.16
	W.Va. S.&M.	75′	48″	60#	3 1/2 R. Pl.	16° 15′	3′ 6″	1/2″	3′ 7 3/4″	4.70	14.00	18.70	5.23	3.00	2.23	17.95	20.99	3.04
5	W.Va. S.&M.	100′	36″	60#	4 1/2 R. Pl.	12° 41′	3′ 9″	1/2″	3′ 11 1/4″	4.90	13.50	18.40	4.04	2.44	1.60	17.95	21.96	4.01
	W.Va. S.&M.	100′	42″	60#	4 R. Pl.	14° 15′	3′ 6″	1/2″	3′ 8″	4.70	14.00	18.70	4.60	3.08	1.52	18.12	24.62	6.50
	A.M.C.	100′	44″	40#–60#	4 R. Pl.	14° 15′	3′ 9″	3/8″	3′ 10 1/2″	4.88	14.67	19.55	4.81	3.08	1.73	18.95	24.62	5.67
	W.Va. S.&M.	100′	48″	60#	4 R. Pl.	14° 15′	3′ 6″	1/2″	3′ 8″	4.70	16.00	20.70	5.10	3.08	2.02	20.06	24.62	4.56
6	W.Va. S.&M.	150′	36″	60#	6 R. Pl.	9° 32′	4′ 3″	1/2″	4′ 6″	5.50	18.00	23.50	3.89	2.07	1.82	23.18	24.84	1.66
	W.Va. S.&M.	150′	42″	60#	5 R. Pl.	11° 25″	3′ 9″	1/2″	3′ 11 1/2″	5.00	17.50	22.50	4.45	2.97	1.48	22.05	29.69	7.64
	W.Va. S.&M.	150′	44″	60#	5 R. Pl.	11° 25′	3′ 9″	1/2″	3′ 11 1/2″	5.00	18.33	23.33	4.62	2.97	1.65	22.87	29.69	6.82
	W.Va. S.&M.	150′	48″	60#	5 R. Pl.	11° 25′	3′ 9″	1/2″	3′ 11 1/2″	5.00	20.00	25.00	4.95	2.97	1.98	24.51	29.69	5.18
7	A.R.E.A.	487.79	56 1/2″	80#–110#	8 Rig. B't'd.	7° 09′ 10″	7′ 11″	1/2″	8′ 3″	* 8.25	37.67	45.92	5.72	3.80	1.92	45.56	60.74	15.18
	A.R.E.A.	778.31	56 1/2″	80#–110#	10 Rig. B't'd.	5° 43′ 29″	10′ 1″	1/2″	10′ 6″	10.50	47.08	57.53	5.74	3.88	1.86	57.29	77.64	20.35
	A.R.E.A.	1998.90	56 1/2″	80#–110#+	16 R.B.M.	3° 34′ 47″	16′ 7″	1/2″	17′ 3″	17.25	75.33	92.58	5.78	3.90	1.88	92.40	124.81	32.41
	A.R.E.A.	3305.65	56 1/2″	80#–110#+	20 R.B.M.	2° 51′ 51″	19′ 10″	1/2″	20′ 8″	20.67	94.17	114.84	5.74	4.13	1.61	114.70	165.18	50.48

* (Col. 10) no allowance required for joint-bar lengths on long-radius curves. Selected radii for A.R.E.A. turnouts taken to nearest even minute of degree or curvature.

Frog angles are purposely shown to nearest minute on relatively short radius curves.

Organizations are abbreviated as follows: American Mining Congress, "A.M.C."; West Virginia Steel & Mfg. Co., "W.Va. S.&M."; American Railway Engineering Association, "A.R.E.A."



PROOF OF RELATIVE ACURACY
OF EXPRESSION "GAGE x FROG NUMBER"

$$\frac{\text{½ gage expressed in feet and decimals thereof}}{\text{tangent ½ frog angle}}$$

No. 2 - 36"ga. = 1.50' ÷ tan. 14°02'10⅝" = 6.000' and 3.00' (gage) x 2(frog No.) = 6.000'
No. 6 - 36"ga. = 1.50' ÷ tan. 4°45'49" = 18.000' and 3.00' (gage) x 6 (frog No.) 18.000'
No. 20 - 56½"ga. = 2.3542' ÷ tan. 1°25'55⅝" = 94.198' and 4.7083' (gage) x 20 (frog No.) = 94.167'

Fig. 1—Specimen turnout and frog diagrams showing the elements involved.

from the manufacturer's catalog data (or measured on the frog itself) plus 1 ft. (see A, Fig 1). This 1-ft. allowance is made to permit the use of straight splice or angle bars at the heel of the frog and also recognizes the fact that rail cannot be curved in the field with an ordinary bender less than 12 in. from the end. The 1-ft. allowance can be increased to 2 ft. or as desired. However, the tabulations herein are based on 1 ft. except as noted. On long-radius turnouts, this 1-ft. allowance becomes meaningless and should be omitted. For proof of the relative accuracy of the expression "gage times frog number" see B, Fig. 1.

3. Multiply the distance obtained under Item 2 by the sine and cosine of the frog angle to obtain the coordinates X_t and Y_t of the point 1 ft. (or as determined) beyond the frog heel as referred to the frog P.I.

4. Multiply the selected radius of the circular curve to be used by the versed sine and sine of the frog angle to obtain the coordinate X_c and Y_c of a point on the circular curve as referred to its P.C.

5. Since the points X_c and X_t must coincide to have the arc tangent at that point, the circular curve must be shifted away from the principal tangent a distance of X_t minus X_c, or "shift," and its P.C. will be in a parallel tangent and pulled back a distance of Y_c minus Y_t, or "pull back," from the frog P.I.

In certain cases Y_t may exceed Y_c, in which case the curve P.C. will fall Y_t minus Y_c ahead of the frog P.I. (see Table I for typical examples; also Fig. 2). It is suggested that the user prepare a tabulation similar to Table I, which will be found very convenient in assembling the necessary information and will serve as well as a permanent record for future reference.

6. To determine the frog location with reference to the lateral-track center line, since the location of the principal P.I. of the lateral-track center line with the principal tangent always is known, calculate the distance back to the frog P.I. per the diagrams covering the three probable conditions at the right in Fig. 3. The "known" is always the distance calculated under Item 2 plus the semi-tangent distance of the curve selected, which corresponds to the total central angle less the frog angle. Thus, A-B equals

$$\text{Item 2 Dist.} + R \text{ Tang } \frac{\text{Total } \Delta - \text{Frog } \Delta}{2}$$

Solve the appropriate triangle for A-C, thus determining the distance from the principal P.I. to the frog P.I. Thus, the theoretical point of frog is located at A-C less gage times frog number from the principal P.I., and the

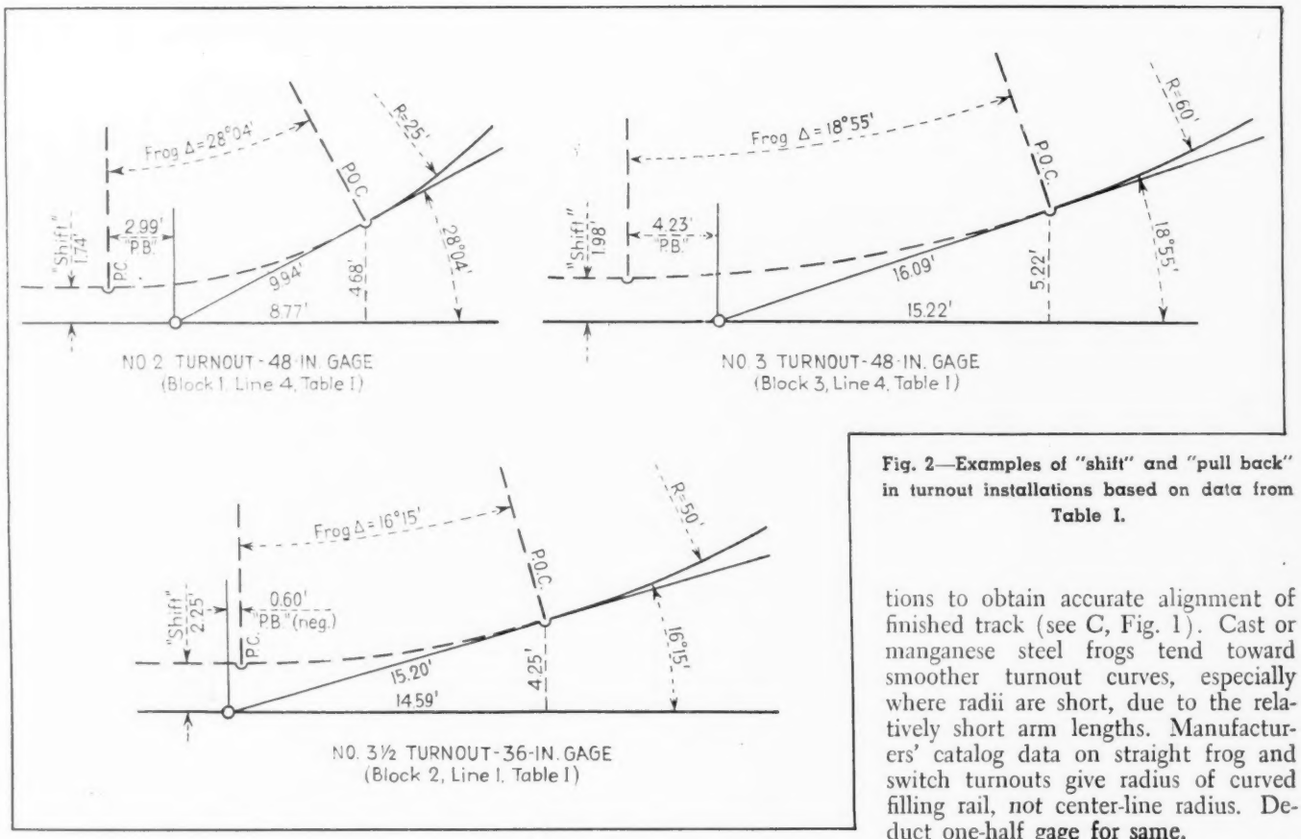


Fig. 2—Examples of "shift" and "pull back" in turnout installations based on data from Table I.

actual point of frog at A-C less gage plus frog-point thickness times the frog number from the same point.

Field Layout

Underground—Measure back from the principal P.I. a distance of A-C plus or minus "pull back," as the case may be, and set a temporary point in the principal tangent. From this temporary point set over at right angles toward the curve center the "shift" distance to set P.C. Knock out the temporary point and establish a parallel tangent through the P.C. Then follow usual curve layout procedure.

On the Surface—Measure back from the principal P.I. the distance A-C and set frog P.I. Set over the frog P.I. and turn frog angle. Intersect the frog and lateral tangents, thereby locating the secondary P.I. (Point *B*, Fig. 3). Set up over this point and measure the semi-tangent distances of the body of the circular curve to locate P.O.C. at or adjacent to the heel of the frog and P.T. in lateral tangent.

Where less precision is required, set up over the frog P.I., turn the frog angle and measure forward the distance calculated under Item 2 to set P.O.C. Run curve in as usual. The latter method could, of course, be used underground, but frequently there is not enough room and other considerations (such as short backsights) are involved.

The relation of the theoretical point of frog and the actual point is important and should be considered in all calculations to obtain accurate alignment of finished track (see C, Fig. 1). Cast or manganese steel frogs tend toward smoother turnout curves, especially where radii are short, due to the relatively short arm lengths. Manufacturers' catalog data on straight frog and switch turnouts give radius of curved filling rail, *not* center-line radius. Deduct one-half gage for same.

The principal railroads have their own standards on turnout details, which may or may not correspond to those of the American Railway Engineering Association, and this should be kept in mind in preparing layouts of trackage over which railroad equipment is to be operated.

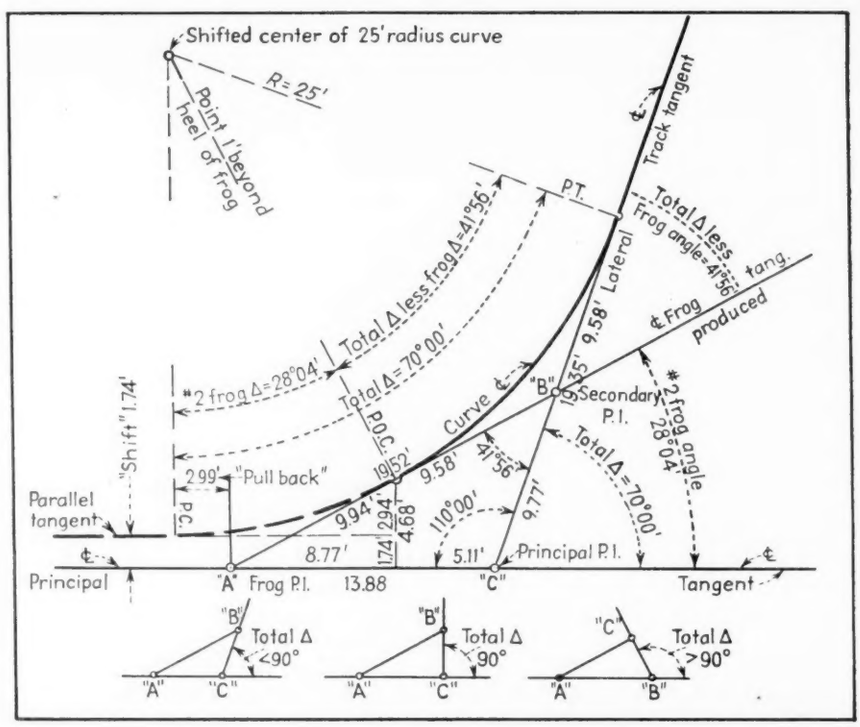
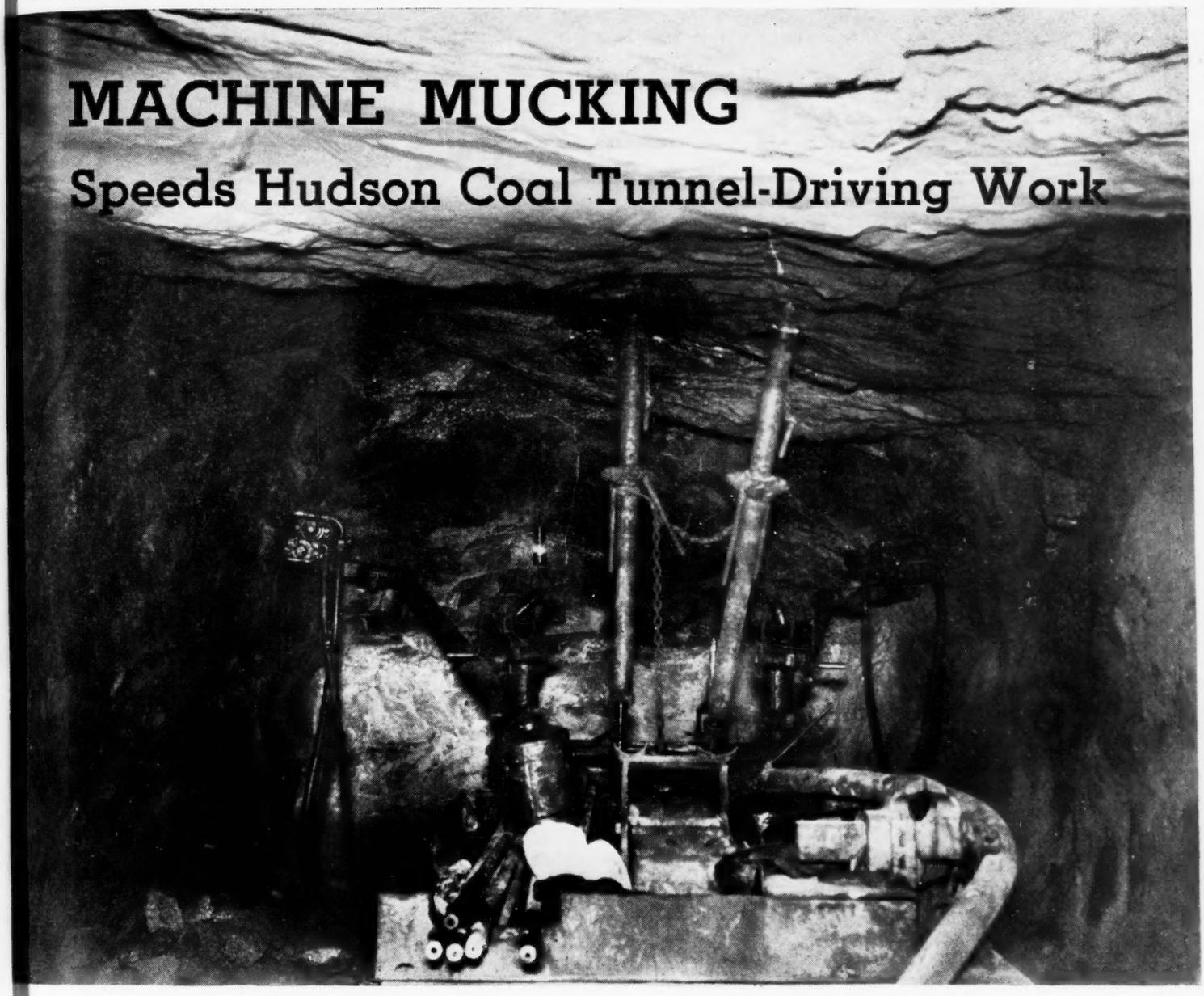


Fig. 3—Typical turnout layout diagram.

MACHINE MUCKING
Speeds Hudson Coal Tunnel-Driving Work



Drill equipment ready for operation at the face of No. 39 tunnel at Baltimore No. 5 colliery.

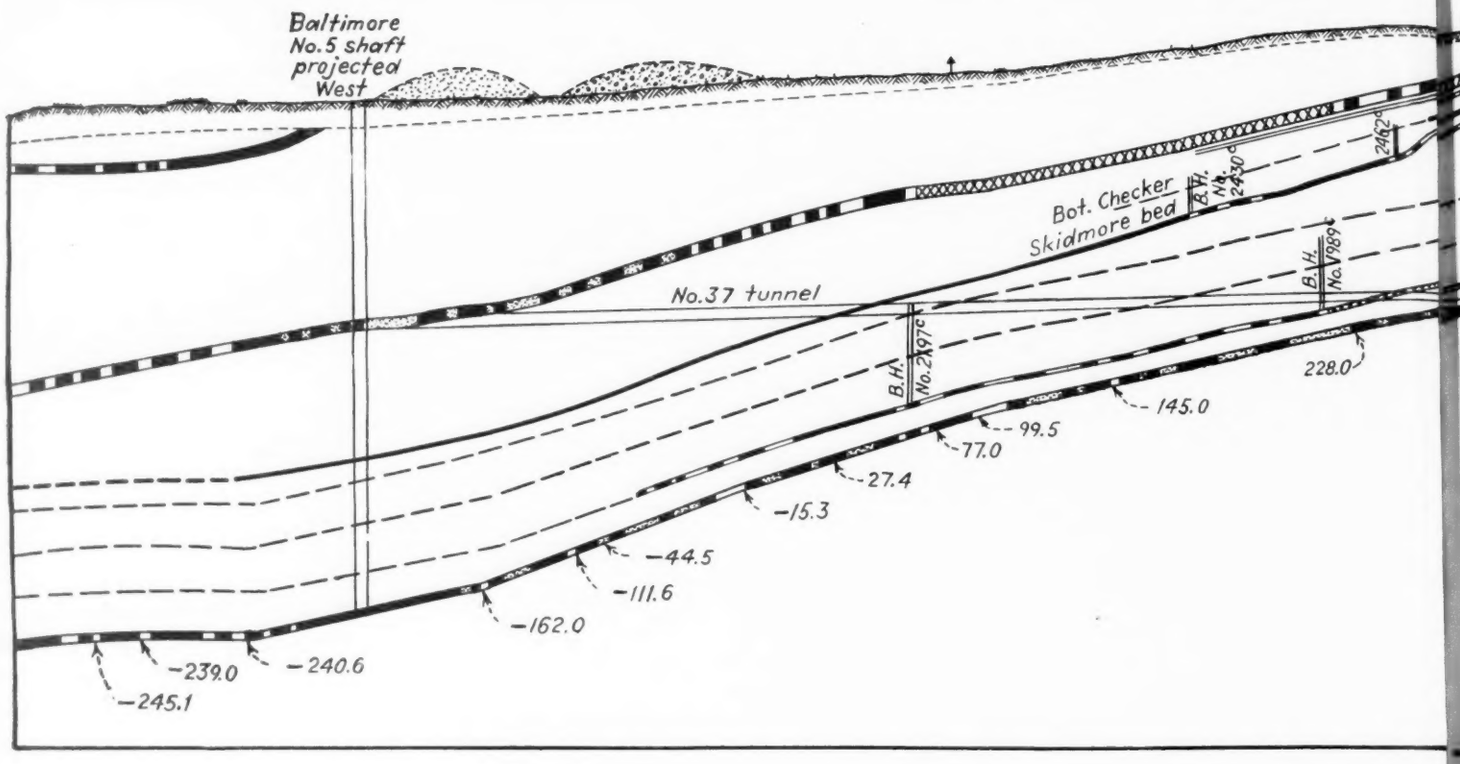
Mining and Haulage Facilitated by Rock Gangways and Tunnels—Mechanical Drilling and Mucking Increase Efficiency in Rock Work—Special Facilities Installed for Drill Steel and Bit Service

By R. R. RICHART
Assistant Editor, Coal Age

OBJECTIVES in rock gangway or tunnel work at collieries of The Hudson Coal Co., Scranton, Pa., also include facilitating second mining or pillar-recovery operations. In some instances the tunnels bypass flooded areas in pitching veins to recover pillars in territories high and dry. In others, tunnels make it possible to substitute underground haulage routes for surface systems to permit the robbing of larger areas in a vein lying close to the surface. But whatever the reason, Hudson uses mechanical drilling and mucking equipment to drive tunnels. As a result, a rock tunnel is advanced 7 to 8 ft. per day in pea-sized conglomerate by a drilling and a mucking crew, each working a seven-hour shift. The use of a mucking machine for driving counters through culm-flushed territories to recover pillars is another activity that will be touched on in this article.

Some of Hudson's more important tunnel jobs are in the Baltimore No. 5 Shaft colliery near Wilkes-Barre, Pa. Years ago when first mining was under way, Baltimore No. 3 Shaft and Baltimore Tunnel had their own breakers. Today, the only breaker left to serve this area is at Baltimore No. 5 Shaft. A projected system of tunnels, including No. 37, already in use, will provide a better underground haulage route to accommodate pillar recovery in the Red Ash vein from the Baltimore No. 3 Shaft and Baltimore Tunnel areas. This will permit the concentration of all the coal at the Baltimore Bed landing of the Baltimore No. 5 Shaft.

No. 37 tunnel, 9x12 ft.x1,650 ft. long,

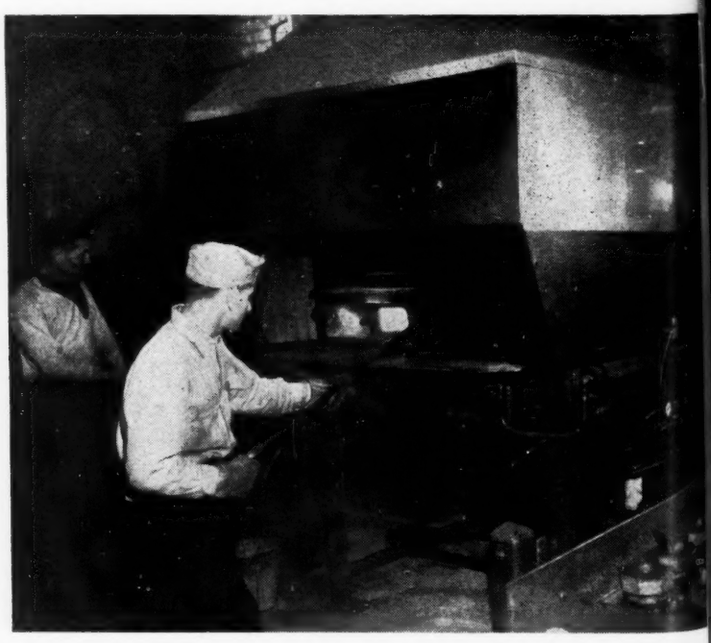


was driven in 18 months during the war despite the manpower shortage and especially a scarcity of rock men. Two 8-ton locomotives, permanently connected in tandem, haul 30-car trips through this tunnel, which has a 4-percent grade in favor of the loads. The 36-in.-gage track is laid with 60-lb. rail.

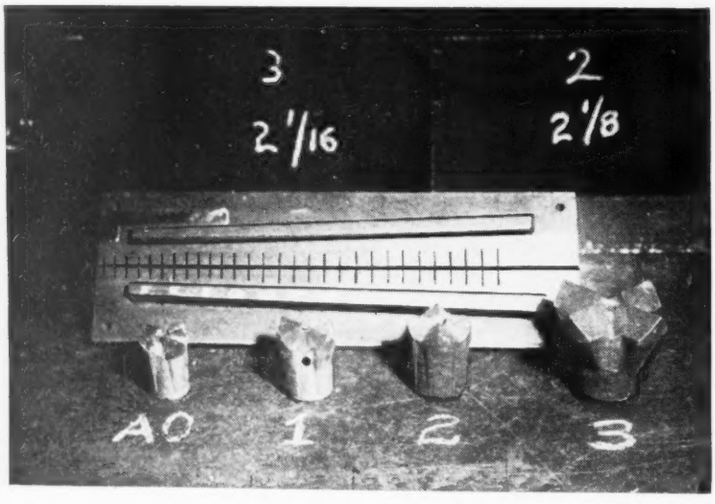
At present, work is progressing on No. 39 tunnel and No. 39 tunnel extension, which will extend some 2,300 ft. on a 0.22 percent grade in favor of the loads. A 7- to 8-ft. cut is made each day. On the afternoon shift the drilling crew drills, charges and fires 29 holes to blast down a fresh fall of rock, mostly pea-size conglomerate. A Type DA-35 3½-in. Ingersoll-Rand and a Type D-14 4-in. Cleveland power-fed drifter mounted on a Type MDR two-boom-rig Cleveland drill carriage operate on compressed air fed through a 4-in. line from compressors on the surface. Type 2 Sibley detachable, or screw-on, bits (Ingersoll-Rand) are used for this hard rock job. Water under pressure is used to flush cuttings from the holes and keeps down the dust. A liquid wetting agent known as Compound "M" (Johnson-March) is used in proportions of one part compound to 500 parts water in all wet drilling work. This solution traps 75 percent of the dust that plain water fails to get. About 200 gal. of water is required for drilling the complete round of 29 holes.

The drilling pattern, shown in an accompanying illustration, is a variation of the "burn cut," sometimes spelled "burnt." The first holes fired are those in the lower center. These five holes lie in the same vertical plane and are drilled parallel to each other the full depth of the cut. Two of the holes are not charged and this gives the other three a chance to break to them. Starting with exploders in the center and following up by other shots in delays up to 0.9

Bits are heated in this oven before the hot milling and tempering operations. Jack-mill operator is working in the background to the left. Tempering pedestals are in the foreground to the right.



Gaging device used and the four types of bits hot milled in the shop.



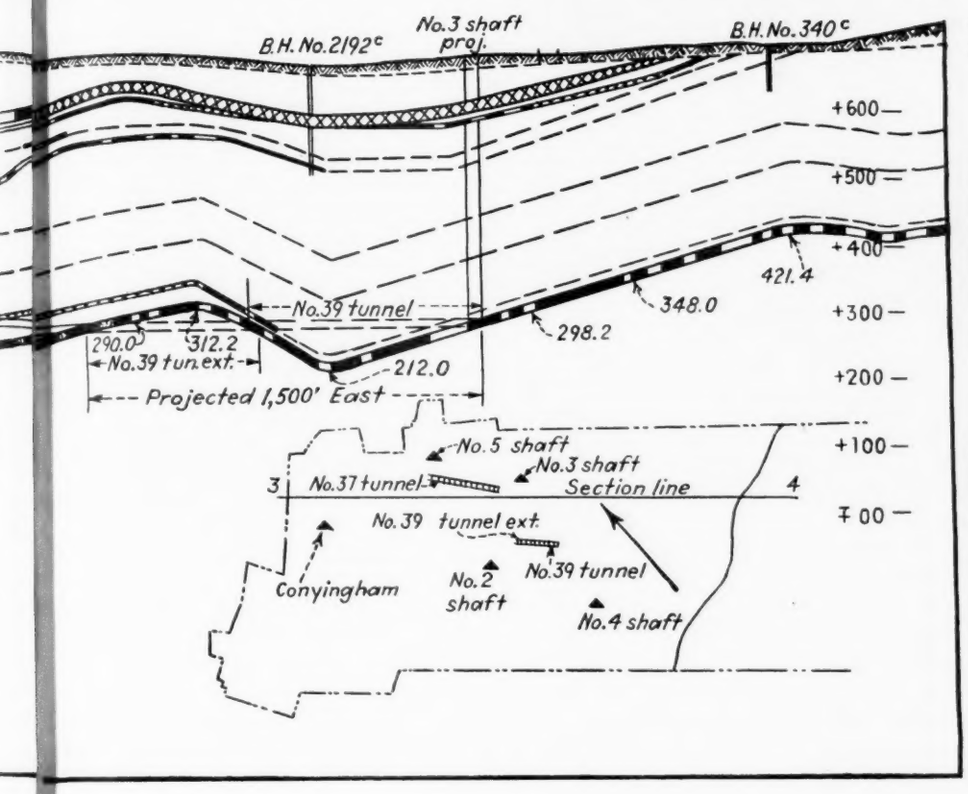
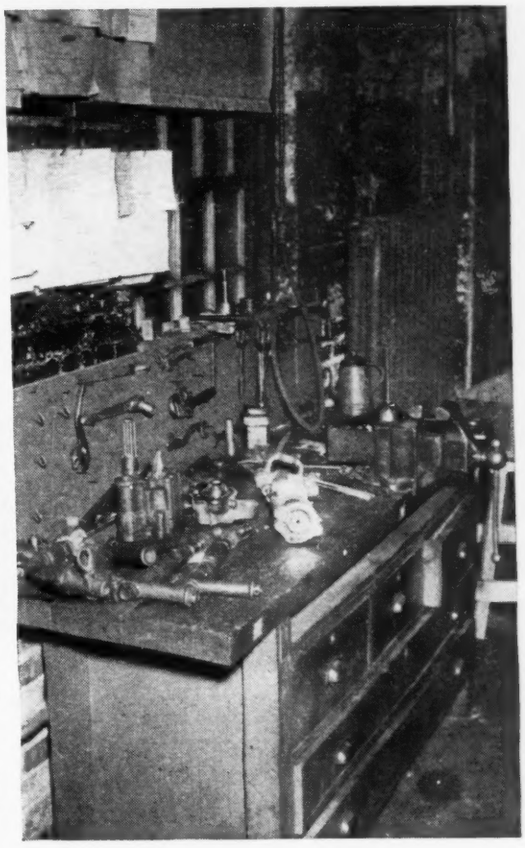


Fig. 1—How the rock tunnels at Baltimore No. 5 colliery are located with respect to the veins being robbed.



Air drills are serviced at this bench and a record is made of new parts installed.

in all four directions breaks up the rock without throwing it out too far in front. Approximately 125 lb. of 60 percent-strength dynamite is used to fire a cut. Each loaded hole is charged with nine to twelve sticks.

Mucking, laying of track and extending of air and water lines are done on the morning shift by a mucking crew. With a Type 20A Conway shovel the crew loads the 14 cars (120 cu.ft. capacity) of rock made by the round in 7 hours. The loading time depends on the car-changing service rendered by the locomotive crew, which also has work to do in other territories. While the Type 20A shovel is no longer manufactured, having been superseded by the Type 125, equipped with a larger bucket and higher-speed motor and capable of loading twice as fast, it nevertheless can load a car of rock at a rate of 25 cu.ft. per

Joseph Husvar, jack-mill operator, changes the setting of the temperature regulator for the furnace prior to heating the bits for tempering.

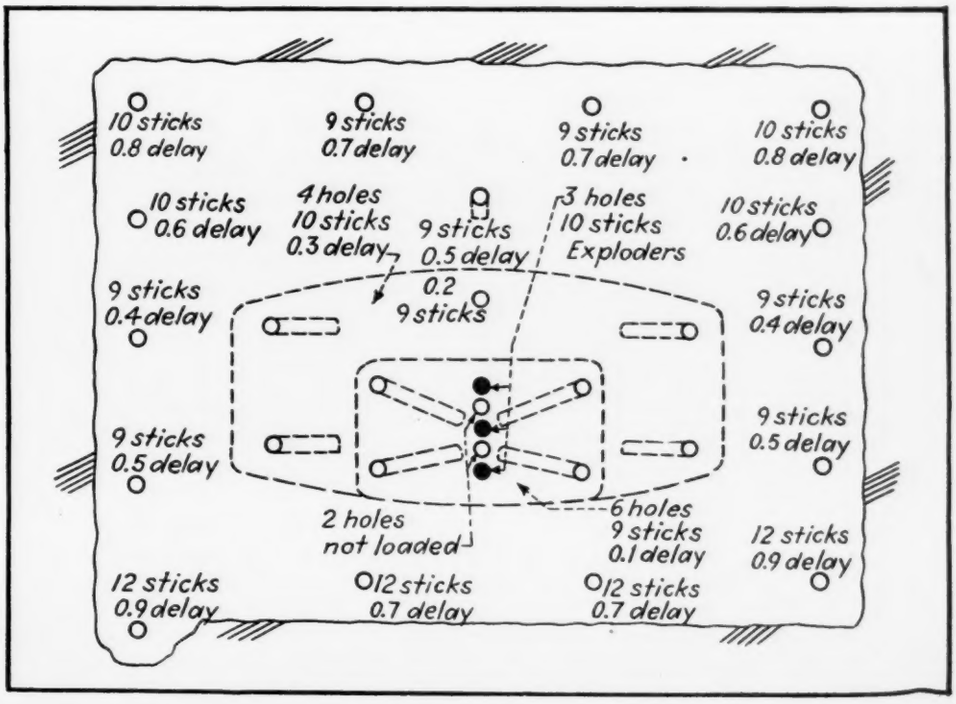

10 sticks 0.8 delay
9 sticks 0.7 delay
9 sticks 0.7 delay
10 sticks 0.8 delay
10 sticks 0.6 delay
4 holes 10 sticks 0.3 delay
9 sticks 0.5 delay
3 holes 10 sticks Exploders
10 sticks 0.6 delay
0.2
9 sticks
9 sticks 0.4 delay
9 sticks 0.4 delay
9 sticks 0.5 delay
9 sticks 0.5 delay
2 holes not loaded
6 holes 9 sticks 0.1 delay
12 sticks 0.9 delay
12 sticks 0.9 delay
12 sticks 0.7 delay
12 sticks 0.7 delay

Fig. 2—How the shotholes are drilled and loaded and the order in which they are fired in rock gangway work at Baltimore No. 5 colliery of The Hudson Coal Co.

Mucking machine driving a counter in a culm-flushed vein at the Boston Shaft colliery.

minute. To do this the dipper must complete five loading cycles per minute.

Drilling, especially in conglomerate, is the slowest and most difficult phase of gangway work. Much of its success depends on the service that can be obtained from the shop-sharpened bits. Hudson Coal is equipped to service its own air drills and sharpen its bits. More than 40 stopers, jackhammers and rock drills for rock work and approximately 700 jackhammers for coal work are repaired in a brick building at the abandoned Dickson colliery. New drill rods are fashioned, old ones reconditioned and four sizes of various types of detachable, or screw-on, bits are hot milled and tempered by the crew in this shop.

To form a jackhammer drill bar from $\frac{7}{8}$-in. hexagonal steel stock the procedure is: (1) cut stock to length on a Size 500 Ingersoll-Rand drill steel and shank cutter (air-driven emery-wheel cutter); (2) heat the end where the screw-on bit is to be attached to a forging heat of 1,900 deg. F.; (3) place in the Type 50 I-R drill sharpener and upset the hot end; (4) cool two or three hours and slow heat for $\frac{1}{2}$ hour at 1,400 deg. F. for annealing; (5) stand hot end in powdered mica for 12 hours to anneal prior to the machining and threading operations; (6) machine in Toledo drill machine set up with I-R box tool; change to threading die and thread; (7) heat to 1,650 deg. F. for tempering; (8) quench in oil bath.

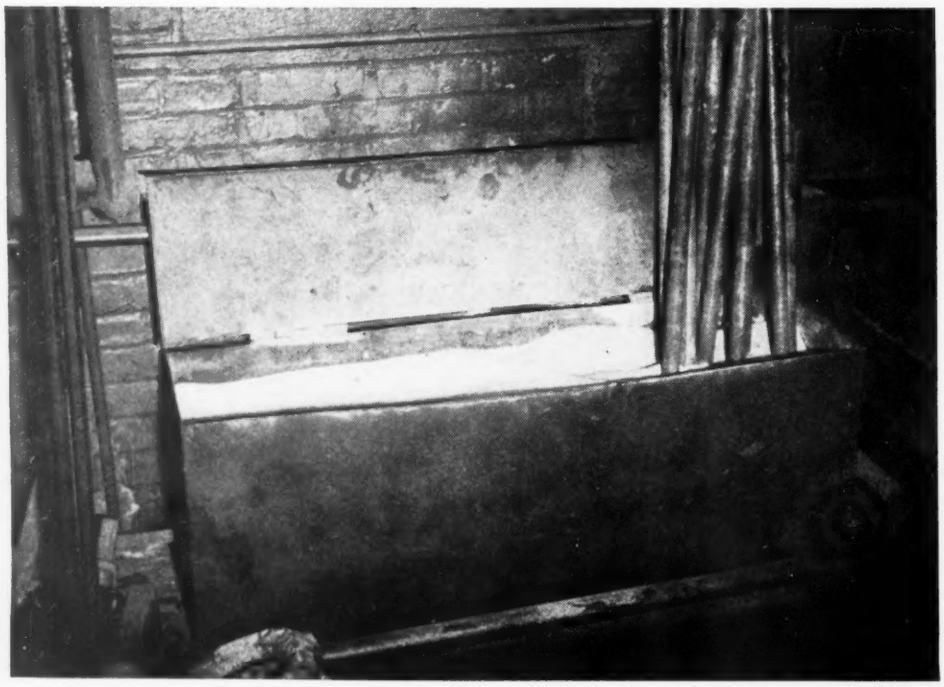
To finish the shank end of the drill bar the steps are: (1) heat the end of the bar to 1,900 deg. F. for forging; (2) insert in the Type 50 I-R drill sharpener where the end is upset and the collar is formed; (3) dress up; (4) heat to 1,650 deg. F. for tempering; (5) quench in an oil bath. The temperature of the oil bath is kept down by circulating cooling water through a jacket tank that surrounds the oil tank.

As much as 5,712 lb., or 2,077 ft., of $\frac{7}{8}$-in. hexagonal drill steel is made into drill bars at this shop in a month.

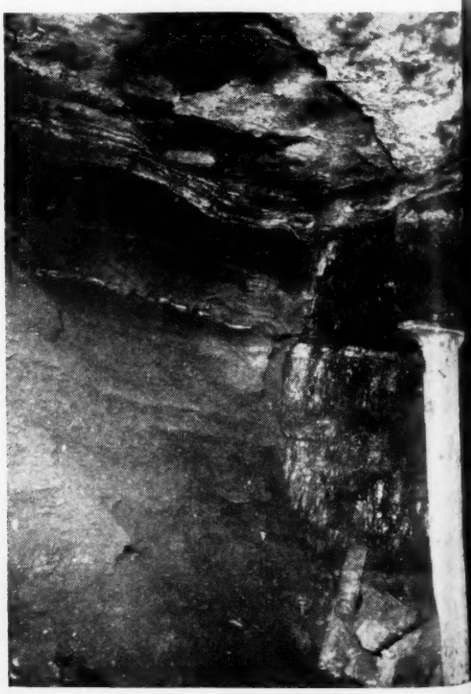
The detachable, or screw-on, bits are sorted as to type, gage and length as they come from the various collieries to be sharpened. Each colliery gets back its own bits after reconditioning. If additional bits are needed they are taken from the supply of new bits in stock. Such fairness rewards a colliery for taking care of its equipment and helps to keep supply costs down.

The sorting operation mentioned makes for more rapid processing of the bits in the hot milling equipment recently installed. The processing, in short, is as follows: (1) heat bits in oil-fired furnace to 1,800 deg. F. for hot milling; (2) hot-mill, gage and punch for side or center hole in a Type JMA Ingersoll-Rand jack mill; (3) cool bits to approximately 300 deg. F.; (4) heat bits in lots of about 100 for 25 minutes at 1,440 deg. F.; when the color of the

Drill bars are cooled in powdered mica for 12 hours as part of the annealing process prior to the threading operation.



Evidence of how a heading can be completely filled by culm flushing.



bits matches that of the thermocouple case at the rear of the oven they are removed for tempering; (5) temper each bit separately on a small pedestal equipped with a water fountain; after the right adapter plate has been selected and placed over the fountain the bit is seated on it socket end up; the pressure of the fountain is regulated for the size bit being tempered; as soon as the bottom of the socket turns black the bit is removed; (6) drop bits into the quenching tank, where the temperature of the water is held at 212 deg. F. Bits stay in this bath approximately an hour, after which they are piled out on the floor and shipped to the colliery. Temperature-regulating equipment maintains the temperature of the water in the tempering tank between 70 and 100 deg. F.

What might be considered both mucking and coal loading work is done in the Boston Shaft colliery by a Type 125 Conway permissible shovel. In driving a counter in the culm-flushed area of the Bennett bed to engage in robbing work the loader loads culm and rock in clean-up operations and coal when driving through the pillars. This 10-ft. vein was flushed by culm and water years ago after first-mining operations were completed. As the counter progresses across the territory it has become apparent that the culm did fill all the passages.

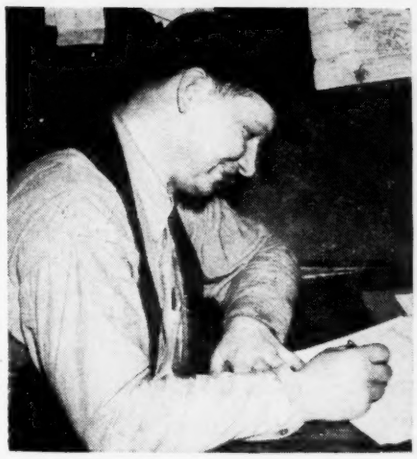
Crews Average 35 Cars

Crews consist of a loader operator, laborer and the part-time services of a locomotive crew working two shifts a day. They average 35 cars (120 cu.ft. capacity) per shift while loading culm and 15 cars when driving through a pillar. The culm is of such quality that it can be sent to the breaker for preparation for market. Timber sets or props are used for roof support, depending on the conditions encountered. When the roof is not broken but timber sets are required, aluminum collars are installed on roof jacks by the regular crew. When a sufficient number of the temporary supports have been installed to justify replacement by the regular wood timber sets, the replacement is made by a regular timbering crew on an off shift. No drilling or firing is required when advancing through the culm but normal methods of drilling and firing are used when advancing through a pillar.

An auxiliary blower and du Pont "Ventube" supply extra air at the face when it is needed.

All operations described in this article are under the direct supervision of Walter B. Petzold, mining engineer; Reynolds Pierce, rock foreman; and the local colliery superintendent in charge where the work is being done.

In Charge for Hudson



Andrew Urisko, assistant rock foreman, supervises operations in the Southern territory.

W. R. Pierce, rock foreman, has charge of all rock-gangway and shaft work.

W. L. Dennen is special engineer for Hudson Coal.

W. I. Stonebraker is superintendent of Baltimore No. 5 colliery.

Inspecting the driving of the counter at Boston Shaft colliery, from left to right, are: Thomas Stires, section foreman; William Wirth, colliery engineer; Fred L. Zollinger, superintendent; and Patrick Dougherty, mine foreman.

DUSTPROOFING

Builds Markets by Satisfying Coal Users

Survey of Operators, Dealers, and Industrial and Domestic Consumers Shows General Agreement on the Value of Dustproofing — Oil First Choice as a Treating Medium—Its Use Also Provides Other Benefits

By H. H. MORRIS
Sun Oil Co.
Philadelphia, Pa.

"DUSTPROOFING" of coal means larger markets for the coal industry in the future. This fact is strikingly brought out in an unbiased survey recently conducted among producers and consumers of anthracite and bituminous coal by an independent research organization. Industrial and domestic consumers and dealers and operators totalling some 2,600 were questioned. The large number of responses supplies conclusive evidence of the importance these interests attach to "dustproofing" of coal and the findings also indicate a strong preference for oil as the treating medium.

By groups, the results of the survey were as follows:

Coal Operators

Number of questionnaires sent to this group, 500; returns, 122, or a 24.4-percent response.

1. Q.—Will coal treatment be a necessary service postwar?
   A.—Anthracite .....Yes, 66%
   Bituminous .....Yes, 83%
2. Q. —Who should treat the coal?
   A.—Operator 77%
   Dealer 23%
3. Q.—What type of treatment is most desirable?
   A.—Petroleum 49%
   Chemical 47%
   Others 4%

The replies indicate that anthracite as well as bituminous operators are today very much aware of the need for "dustproofing" their coal so that their product will remain competitive with other fuels now fighting for coal's markets. It should be noted that 77 percent of the operators believe it is their responsibility to dustproof the coal before it is shipped from the mine.

Coal Dealers

Number of questionnaires sent to this group, 500; returns, 205, or a 41.0-percent response.

1. Q.—Will it be necessary to market treated coal in the postwar period?
   A.—Anthracite .....Yes, 76%
   Bituminous .....Yes, 84%
2. Q.—Who should treat coal?
   A.—Dealer 7%
   Operator 93%
3. Q.—What type of treatment is desirable?
   A.—Petroleum 51%
   Chemical 35%
   Others 14%

As in the case of the operators, the overwhelming majority of dealers realize the necessity of treating all types of coal (anthracite and bituminous) to meet present-day competition. The dealers agree with the operators that treatment should be at the mine and 51 percent of the dealers prefer oil.

Industrial Plants

Number of questionnaires sent to this group (industrial plants purchasing either anthracite or bituminous coal), 600; returns, 170, or a 28.3-percent response.

1. Q.—Will you demand dustproof fuel?
   A.—Anthracite .....Yes, 43%
   Bituminous .....Yes, 41%
2. Q.—What method of treatment do you prefer?
   A.—Petroleum 60%
   Chemical 31%
   Others 9%
3. Q.—Would the advantage of treated coal justify a slight increase in cost?
   A.—Anthracite .....Yes, 54%
   Bituminous .....Yes, 59%

Until recently, it was generally believed that industrial consumers were indifferent to the value of "dustproofing" of coal. Now, however, it is interesting to note that about 43 percent demand dustproofed fuel and that of these nearly two-thirds (60 percent) have a definite preference for oil treatment. Over 54 percent would be willing to pay extra for treating.

Consumers

More than 1,000 questionnaires were mailed to these purchasers of anthracite and bituminous coal. The questionnaire referred to these fuels as "hard" and "soft" coal as a matter of clarification and simplification for the consumer. The total of 339 replies, or 33.9 percent, was exceptionally high, reflecting an unusual interest in this subject.

1. Q.—Would you consider dustproofing an important feature in purchasing?
   A.—Hard coal .....Yes, 91%
   Soft coal .....Yes, 96%
2. Q.—Would you ask for dustproof treatment from your dealer?
   A.—Hard coal .....Yes, 91%
   Soft coal .....Yes, 98%
3. Q.—Would you be willing to pay extra for such coal treatment?
   A. .....Yes, 95%

This response indicates that consumers will demand "dustproofed" coal. Coal authorities who have reviewed these replies agree that "We cannot overlook the consumers' desires, so we had better prepare to supply 'dustproofed' coal—as demanded." The answers show that the consumer is willing to pay for treatment—a fact many operators and dealers have questioned in the past. The consumer says "yes" to extra cost for this extra service in 95 percent of the replies.

Cleanliness is a characteristic desired in all fuels. The control or elimination of dust during the preparation, transportation, storage and use of coal has been a problem since mining began. Probably the oldest known method of controlling dust was the use of water. This proved to be only partially effective and failed to provide permanency of treatment. Also, it frequently resulted in excessive and unwelcome moisture in cel-

HOW PRODUCERS, DEALERS AND CONSUMERS RESPONDED TO SURVEY ON DUSTPROOFING OF COAL

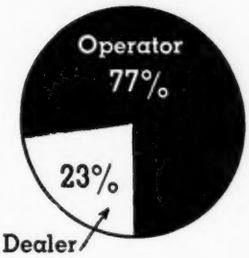
OPERATORS

Consider treatment necessary postwar:

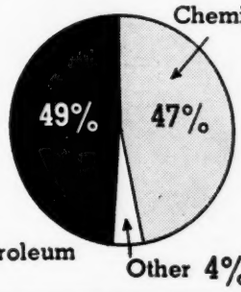
ANTHACITE

BITUMINOUS

Prefer treatment by:



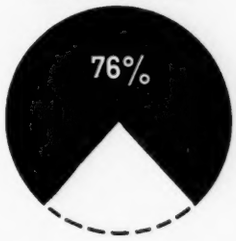
Consider most desirable for treatment:



DEALERS

Consider treatment necessary in marketing postwar:

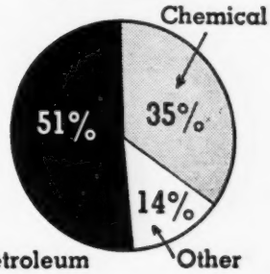
ANTHRACITE



BITUMINOUS

Prefer treatment by:

Consider most desirable for treatment:



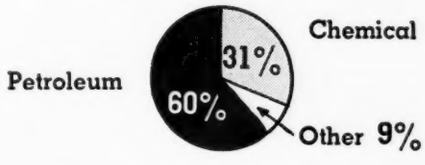
INDUSTRIAL PLANTS USING ANTHRACITE OR BITUMINOUS

Will demand dustproof fuel:

ANTHRACITE

BITUMINOUS

Consider most desirable for treatment



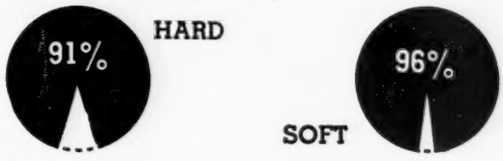
Consider cost increase justified:

ANTHRACITE

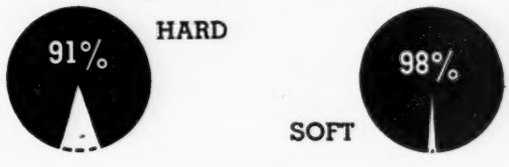
BITUMINOUS

CONSUMERS USING HARD OR SOFT COAL

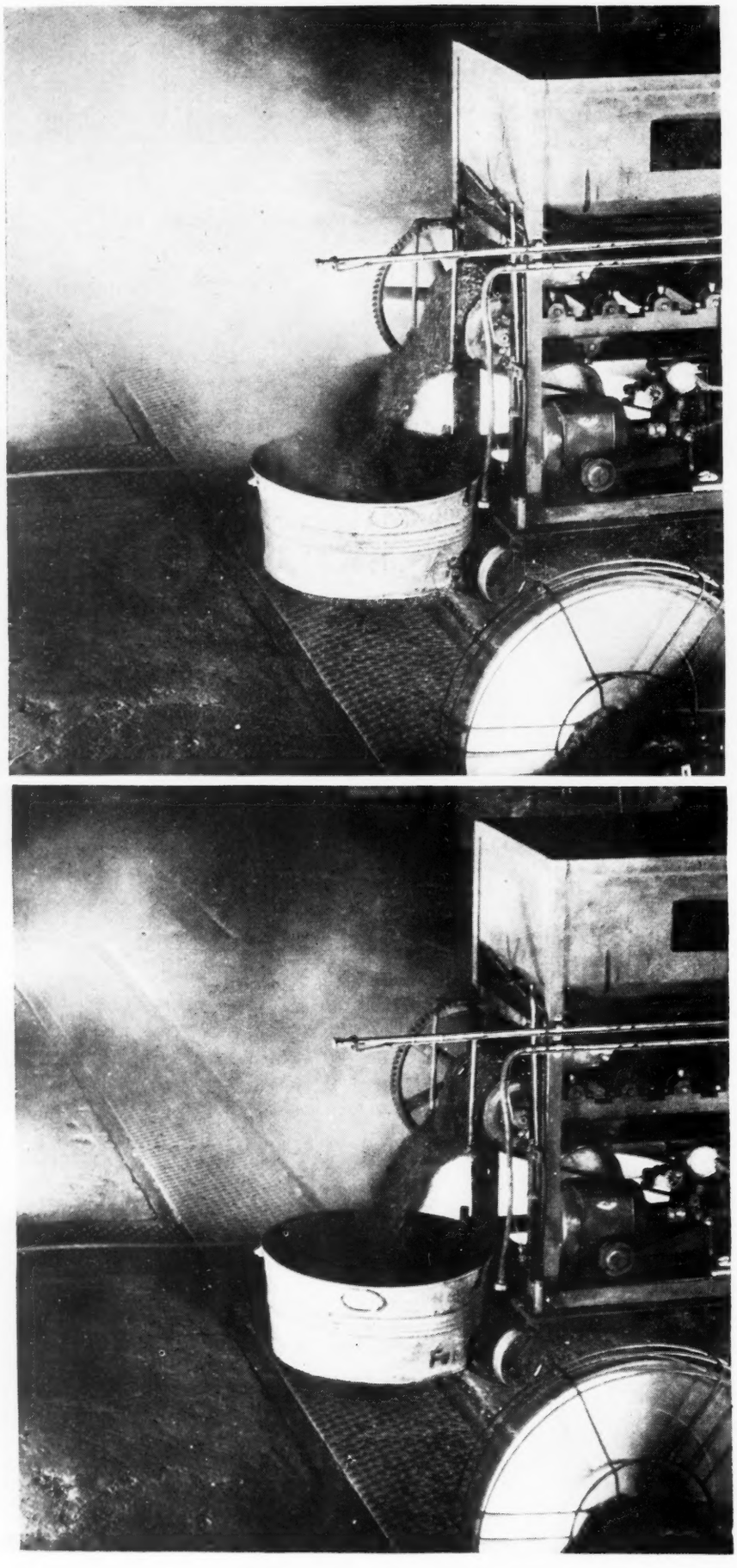
Consider dustproofing important in purchasing:



Would ask for treated coal:



Would be willing to pay extra:



How oil treatment reduces dust emission. In this illustration, made at the Battelle Memorial Institute, untreated 0x⅜-in. Pittsburgh pulverizer coal is shown at the top; treated with 5.1 qt. of oil per ton at the bottom.

lars and involved freezing difficulties during transit and storage.

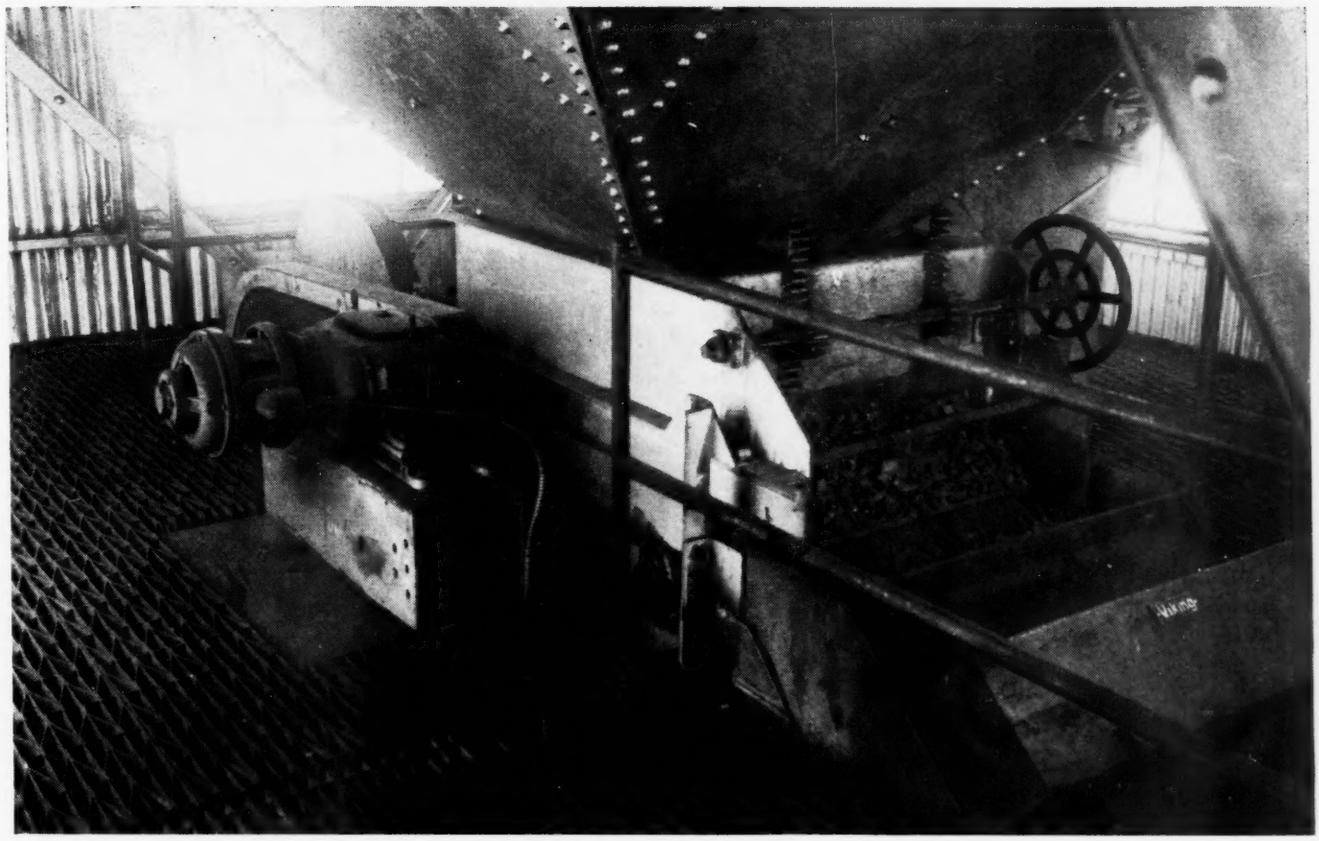
Realizing the inadequacy of water as an efficient, permanent dust eliminator, experiments were initiated in the early 1920's using various oils, oil emulsions, resins, waxes and oils and chemicals alone or mixed with various agricultural products. Available data indicate that dustproofing coal on a commercial scale was first undertaken in 1926 by an operator in the Pocahontas field. Calcium chloride was the agent employed. The purpose of the treatment was to make the particular fuel more acceptable to domestic users and also to eliminate the freezing difficulties that were being encountered during the winter months.

Although calcium chloride was used in increasing quantities by coal operators, experiments with other products continued. By 1935, both consumers and operators generally accepted "straight" oil and other petroleum products as efficient, satisfactory agents for "dustproofing" coal. From 1935 until 1942, when governmental wartime regulations went into effect, "straight" oil treatment increased by leaps and bounds. Today, with governmental restrictions lifted, ever-increasing quantities of straight oil are being used to "dustproof" solid fuel.

The growth in the use of petroleum products for "dustproofing" coal over the past several years also has been reflected in the production of many technical papers on the subject. For instance, Messrs. Pilcher and Sherman, of the Battelle Memorial Institute, presented a study entitled "Experimental Investigation of the Use of Oil for the Treatment of Coal" at the 1938 meeting of the American Society of Mechanical Engineers in New York City. The results given in this paper were based on extensive laboratory tests and field observations, and the findings are worthy of careful study.

"Dustproofing" Oils

Based on the facts given in the paper just referred to and on field experience, it has been definitely determined that petroleum products selected for "dustproofing" should be free from objectionable odors and should have a low "pour point"—preferably below zero. The product also should have high "coverage" characteristics and should be noncorrosive with respect to coal-handling equipment.



Dustproofing at the mine generally is preferred by both operator and dealer. Here, one fraction of what eventually will be a blend is being treated in the chute from the blending bin. The hood confines the oil vapors and reduces waste.

Tests and actual experience over the years warrant the following conclusions:

1. Pennsylvania, West Virginia, Virginia and other high-rank coals have been treated successfully with oils having a viscosity of 200 seconds or higher, Saybolt Universal at 100 deg. F.

2. Due to moisture content at the time of treatment and possibly also to minute cracks that may absorb oil, low-rank-coals may be most efficiently treated with oils having viscosities of approximately 600 seconds, Saybolt Universal at 100 deg. F.

3. Quantities of oil required to treat coal effectively will vary with the size of the fuel—the smaller sizes requiring the larger quantities.

Point of Treatment

Obtaining the maximum "coverage" from the oil applied is a matter of paramount importance and a great deal of experimentation and discussion have gone into the endeavor to arrive at a correct answer to this problem. Oil is applied to coal through spray nozzles generally placed some 16 to 18 in. above the coal bed. To confine the "oil spray" properly, steel hoods are erected to house the spray nozzles and thus eliminate waste.

In practice, coal is treated at the mines at one or more of the following locations:

1. At the end of the loading boom as it is placed in the railroad car.

2. At the "mouths" of vertical chutes loading slack or other fine sizes directly to the railroad cars.

3. At the ends of screens or chutes where the coal "falls" into loading booms or conveyors.

4. On loading booms after the coal has passed that portion of the boom used as a picking table.

5. At the knuckles of loading booms.

Although the coal may be treated at any one or several of the locations previously mentioned, as well as certain others, most operators treat only at the ends of the loading booms or loading chutes.

Oil-Treating Equipment

Two satisfactory methods have been developed over the years for the application of oil. These, generally are known as the "hot" and "cold" systems. Both have given excellent results.

"Cold" System—Advocates of this system contend that by using a properly selected nozzle and a pump providing oil pressures ranging from 300 to 600 lb. per square inch, coal-treating oils, despite their change in viscosity with atmospheric temperature fluctuations, may be effectively applied to solid fuels.

The equipment required for this system consists mainly of the following:

Storage tank.

Small unloading pump with motor and electrical controls.

Pressure pump with motor and electrical controls.

Necessary pipe and fittings.

Meters.

Impact nozzles.

"Hot" System—Advocates of this system assert that the best atomization of oil and uniformity in rate of application are obtained, irrespective of atmospheric temperature variations, by maintaining a constant low oil viscosity in the spray system. It also is inferred sometimes that a "heated" oil will result in better "creep" and "coverage" than "cold."

The "hot"-oil system employs pressures generally ranging from 100 to 150 lb. per square inch. Steam or electric heaters are installed that, under thermostatic controls, heat the oil to a predetermined temperature—usually held at about 150 deg. F., although it may be as high as 200 deg. F.

Heaters are placed as near as possible

Table I—Results of Tests on the Use of Oil as a Means of Preventing Freezing of Coal

Test Number	Size of Coal	Moisture Content of Coal, Percent	Quantity of Oil Applied per Ton, Quarts	Remarks
1.....	Slack	4.5	None	Coal frozen solid.
			2	Some 1 in. balls; these, however, crumbled easily.
			4	No coal frozen.
2.....	Nut	4 to 5	None	Coal frozen to bottom of pan; four 2½-in. lumps frozen hard.
			1.8	Two 2-in. lumps; none, however, sticking to pan; lumps easily broken.
			Over. 1.8	No improvement over test using 1.8 qt.
3.....	Stove	About 3.5	None	Fine coal frozen; large sizes slightly stuck.
			1.7	Fines frozen but could easily be scraped from sides; no large pieces stuck.
			3.3	No fines or lumps frozen.
4.....	Wet slack	10	None	Frozen solid.
			1.6	Bottom frozen hard; top easily broken.
			3.5	All coal on bottom frozen for a depth of ½ in.; above this, coal was loose.
			6	No coal frozen together nor to pan.

Table II—Quantities of Oil Required to Dustproof Properly Various *Bituminous* Coals

Test Number	Coal Source	Size of Coal	Tons Treated	Oil Viscosity	Oil per Ton
1.....	Pa.	0x¼	350	100	1½ qt.
1A.....	Pa.	0x¾	50	100	1½ qt.
2.....	Pa.	Pea	50	100	2 qt.
2A.....	Pa.	1x2	50	100	1 1/8 qt.
2B.....	Pa.	R/M	50	100	8/10 qt.
3.....	Pa.	5/8x1	50	100	2 qt.
3A.....	Pa.	4x6	50	100	1 qt.
4.....	Ky.	0x1¼	50	200	0.72 gal.
5.....	W. Va.	Lump	300	100	0.55 gal.
6.....	W. Va.	Coarse R/M	300	200	0.74 gal.
7.....	W. Va.	0x1¼	428	200	0.75 gal.
8.....	Va.	¼x2	315	200	0.64 gal.

to the spray nozzles. However, in certain plants where the nozzles are away from the heater, an ingenious method of maintaining temperature has been evolved. Piping is installed to create a closed circuit from the heater to the various nozzles and back to the heater "intake." This provides a constant oil viscosity at all nozzles and is particularly important in overcoming any chilling of the oil during long shutdowns.

The equipment required for this system consists mainly of the following:

Storage tank.

Small unloading pump with motor and electrical controls.

Pressure pump with motor and electrical controls.

Necessary pipe, fittings, insulation.

Heating unit.

Thermostatic controls.

Nozzles.

Spray hoods as necessary.

The capacity of the storage tank should be somewhat larger than the capacity of the railroad tank cars in which the oil will be delivered. This overcapacity provides a factor of safety in offsetting delays that might be encountered in railroad deliveries.

It is advisable to have a small unloading pump so that oil may be transferred from tank car to storage tank without interfering with the operation of the dustproofing system.

Overcoming Freezing

Many bituminous operators have encountered complaints from customers that their coal, upon delivery in the winter, was frozen in the railroad cars. One large operator who had been receiving such complaints decided to investigate the possibility of overcoming the difficulty by oil treatment. He prepared thoroughly mixed and quartered samples of his product, which was a blend of "dry" and "washed" coal. The quartered samples were placed in pans approximately 4 in. deep. They included both untreated and treated coal, using various quantities of oil. The pans containing the coal then were placed in a refrigerator chamber with a temperature of minus 10 deg. F. After sufficient time had elapsed to permit thorough freezing where such freezing normally would occur, the pans were removed from the refrigerator and the condition of the coal was determined. Findings are summarized in Table I.

It will be noted that the data in Table I conclusively indicate the non-freezing benefits derived from treating coal with oil. It also is worth noting that the operator who ran the tests has used oil continuously for many years and has eliminated his past freezing troubles.

Oil Consumption

For the benefit of those concerned, Table II lists data on the small quantity of oil required for proper "dustproofing" of coals from various fields.

"Dustproofing" coal with straight oil has met with customer acceptance and has enabled the coal industry to enlarge its markets. "Dustproofing" with oil also has enabled underfeed domestic stoker manufacturers to sell thousands of machines to small householders. Oil-treated coal, according to the results of the survey presented earlier in this article, will be more and more in demand.

Besides the other important facts brought out in the preceding material, oil treatment of coal offers additional provided benefits. These include:

1. Minimizing segregation of fines in stoker coals, thereby providing a more even fuel bed.

2. Eliminating "arching" when coal is stored, thereby facilitating automatic feeding to underfeed domestic stokers.

3. Helping lubricate stoker feeds.

4. Checking slacking of coal that has been placed in storage.

5. Eliminating freezing of moist coals in railroad cars during the winter.

FAN FAILURE

Deenergizes Underground Power Circuits

Failure of Either of Three Ventilating Fans Automatically Halts Flow of Power From All Substations to the Underground Circuits—Spare Motors Help to Insure Continuity in Mine Ventilation Service

By J. G. POLLOCK
Electrical Engineer,
Monroe Coal Mining Co.

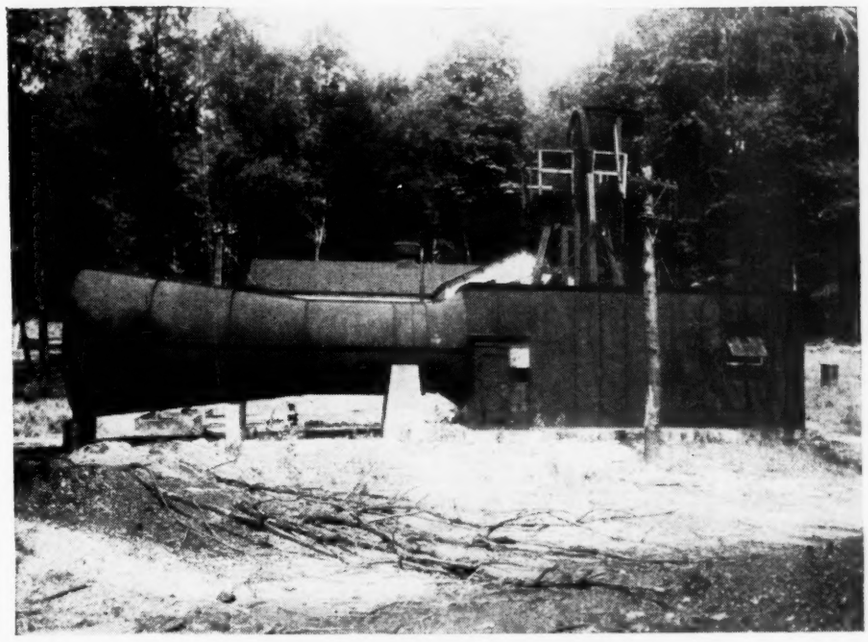
And R. R. RICHART
Assistant Editor, Coal Age

PROTECTIVE interlocking is employed for automatically cutting off the power from all substations to the underground circuits in case of any interruption in ventilation at the Monroe Coal Mining Co.'s Revloc No. 1 mine, Revloc, Cambria County, Pa. The substations have a combined continuous rating of 2,500 kw.

Because of the gas encountered in the 4-ft. Lower Kittanning (Miller) seam and the difficulty of keeping aircourses clean, the best in ventilation must be maintained. It was to eliminate any human shortcomings and provide the utmost protection to the ventilating and power systems that automatic interlocking between fans and substation equipment was provided.

Since the seam is thin, all power-conversion equipment is located on the surface and d.c. power is taken down by drillholes. After 29 years of operation, substations must of necessity be scattered to put power down near the working territories. At present, seven substations comprise the network that fans out from No. 1 at the main shaft. To make the rounds of all these outlying stations the maintenance crew drives 36 miles over highway pavement and company-installed cinder roads. Two of the three ventilating fans are located at two of these outlying substations.

All three fans and the seven outlying substations are under the supervision of operators on duty at No. 1 substation 24 hours a day. Should any one of the three fans shut down, a signal is immediately transmitted to No. 1 substation, where it is relayed to all the outlying stations. In this manner all the circuits feeding the underground d.c. distribution system are deenergized simultaneously. Power is withheld, at the discretion of the oper-



No. 3 fan is located near No. 5 substation.

Relays mounted above the switchboard help cut off the d.c. power when a fan stops.

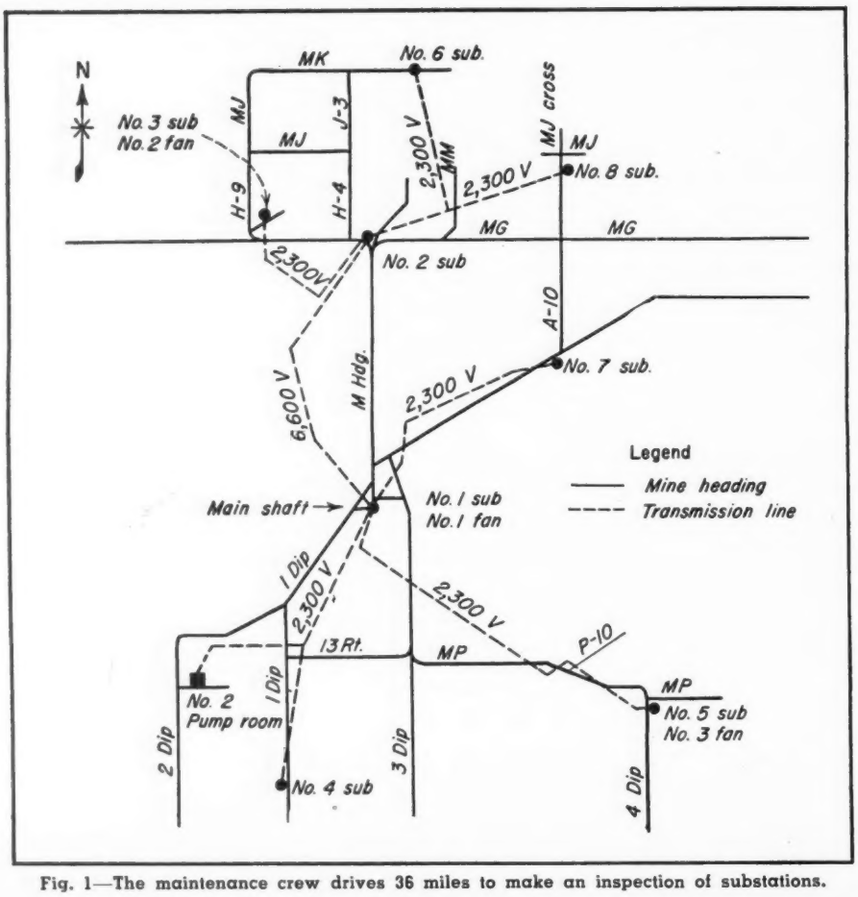


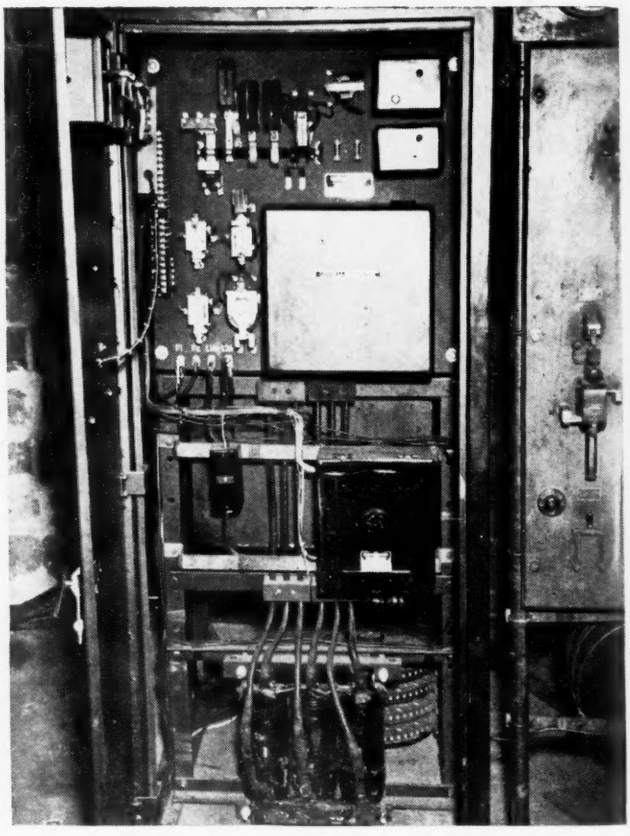
Fig. 1—The maintenance crew drives 36 miles to make an inspection of substations.

ator, until ventilation has been restored for a definite time.

If any fan is down half an hour or longer all the men are brought out and the mine is examined before power is restored. If the fan outage lasts less than half an hour the fan must operate for an interval equal to twice the time it was stopped before the d.c. power can be restored. The methane content of the mine air at the splits is held to 0.25 or 0.30 percent. Approximately 1,500,000 cu.ft. of gas is carried out by the air in a 24-hour period. Permanent stoppings are concrete block and there is no auxiliary ventilating equipment underground.

The oldest fan is a 6x12-ft. Jeffrey centrifugal adjacent to the substation at the shaft. It is driven by a 400-hp. Westinghouse Type CW 2,200-volt slip-ring motor and exhausts 226,550 c.f.m. at a 5.5-in. w.g. A contactor-type control with five steps of resistance prevents undue slipping of the flat belt used to drive the fan. A spare 500-hp. General Electric Type MT 2,200-volt slip-ring motor is mounted ready to drive the fan in the event of failure of the regular motor. One control serves both motors, the connections being shifted to accommodate the motor in service.

No. 2 fan, installed at No. 3 substation in 1936, is a 3½x7-ft. Jeffrey cen-



Left, Joseph Paul, operator at No. 1 substation, stands before the panel carrying the master lockout button (note circled padlock) for holding off all the d.c. power. Right, control panel belonging with the 150-kw. m.g. set in No. 7 substation.

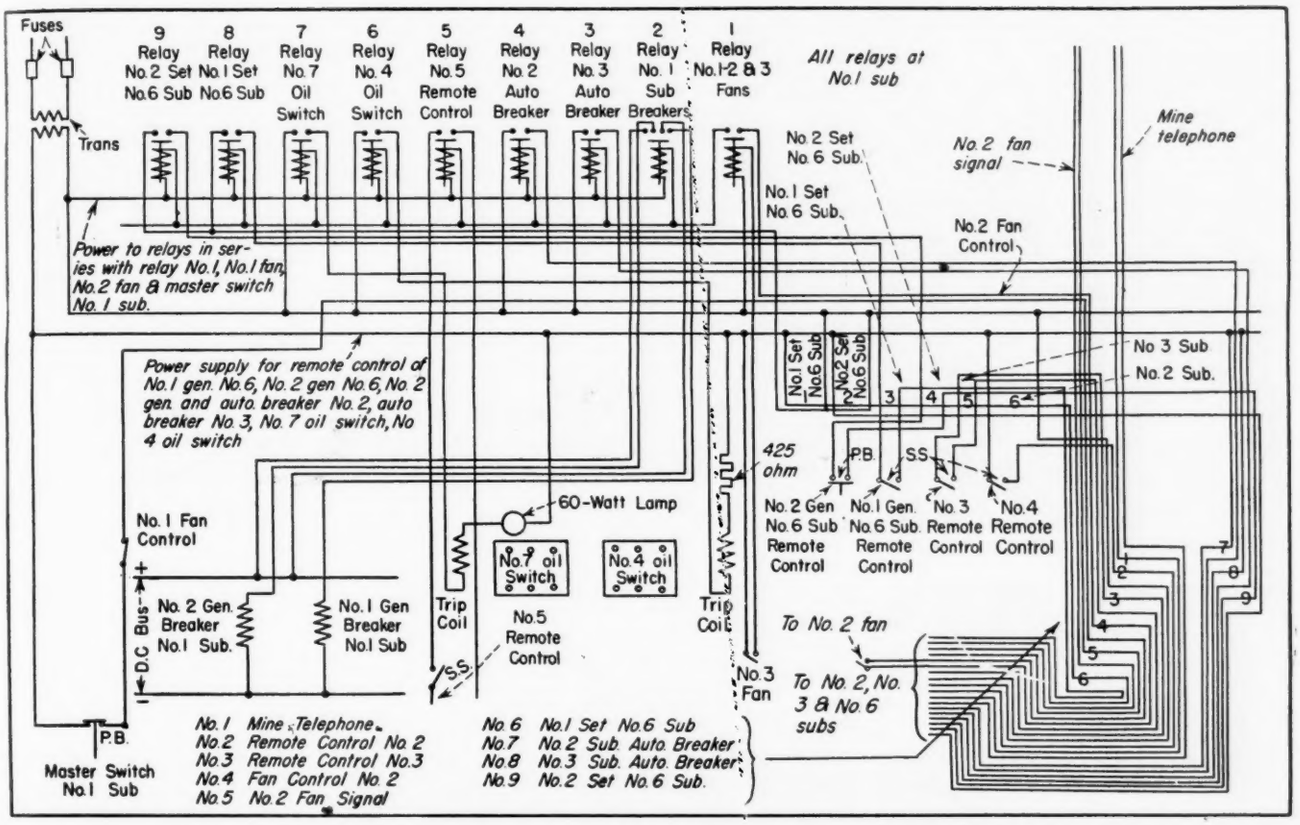
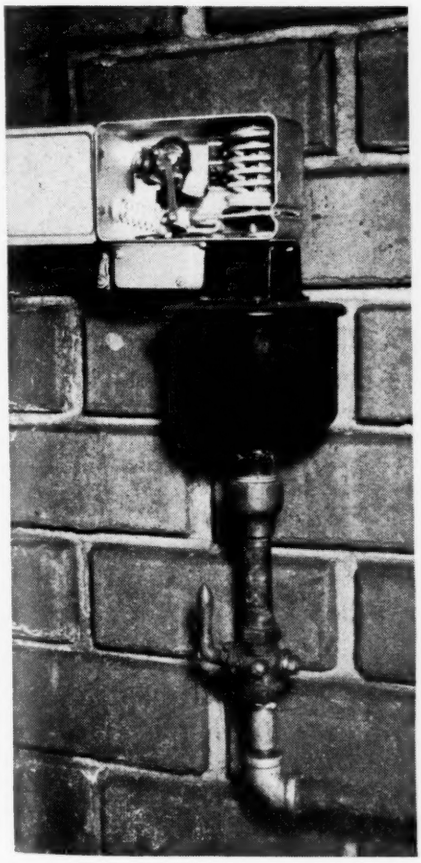
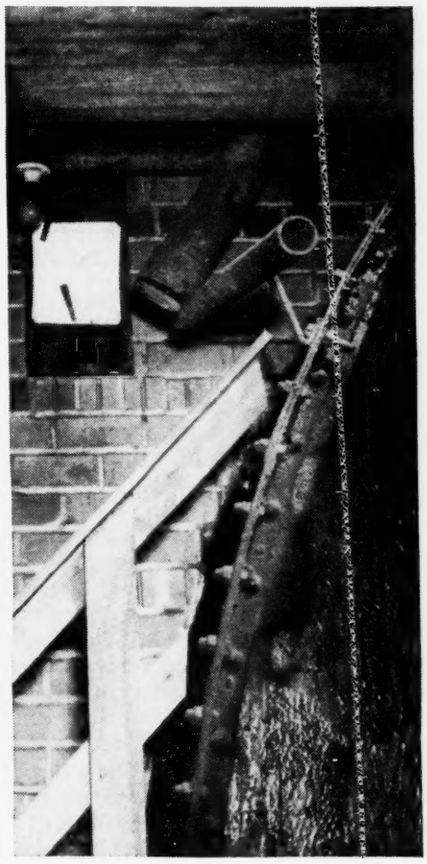

Fuses
9 Relay No.2 Set No.6 Sub
8 Relay No.1 Set No.6 Sub
7 Relay No.7 Oil Switch
6 Relay No.4 Oil Switch
5 Relay No.5 Remote Control
4 Relay No.2 Auto Breaker
3 Relay No.3 Auto Breaker
2 Relay No.1 Sub Breakers
1 Relay No.1-2 & 3 Fans
All relays at No.1 sub
Trans
Mine telephone
No.2 Set No.6 Sub.
No.2 fan signal
No.1 Set No.6 Sub.
No.2 Fan Control
Power to relays in series with relay No.1, No.1 fan, No.2 fan & master switch No.1 sub.
Power supply for remote control of No.1 gen. No.6, No.2 gen No.6, No.2 gen. and auto. breaker No.2, auto breaker No.3, No.7 oil switch, No 4 oil switch
No.3 Sub
No.2 Sub.
425 ohm
PB
SS
60-Watt Lamp
No.2 Gen No.6 Sub Remote Control
No.1 Gen. No.6 Sub. Remote Control
No.3 Remote Control
No.4 Remote Control
No.1 Fan Control
No.7 oil Switch
No.4 oil Switch
D.C. Bus
No.2 Gen. Breaker No.1 Sub.
No.1 Gen Breaker No.1 Sub
Trip Coil
No.5 Remote Control
To No.2 fan
No.3 Fan
To No.2, No.3 & No.6 subs
P.B.
Master Switch No.1 Sub
No.1 Mine Telephone
No.2 Remote Control No.2
No.3 Remote Control No.3
No.4 Fan Control No.2
No.5 No.2 Fan Signal
No.6 No.1 Set No.6 Sub
No.7 No.2 Sub. Auto. Breaker
No.8 No.3 Sub. Auto. Breaker
No.9 No.2 Set No.6 Sub.

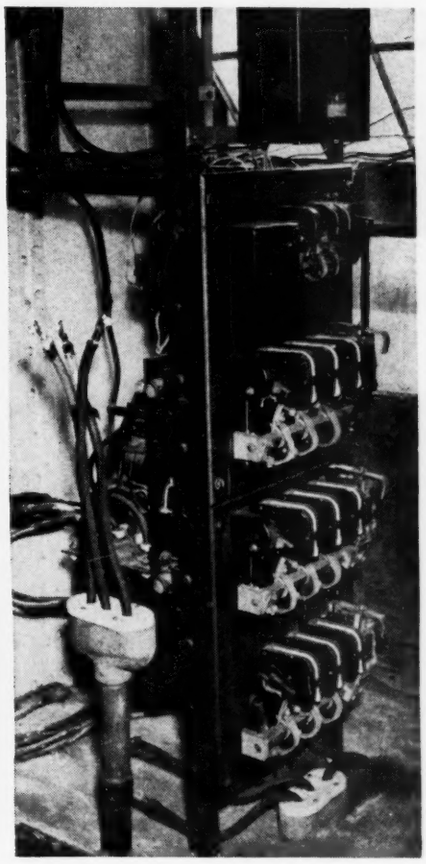
Fig. 2—How protective interlocking between fans and substations is achieved through relays at No. 1 substation.



The vacuum switch is tested once each week by turning the valve in the line.

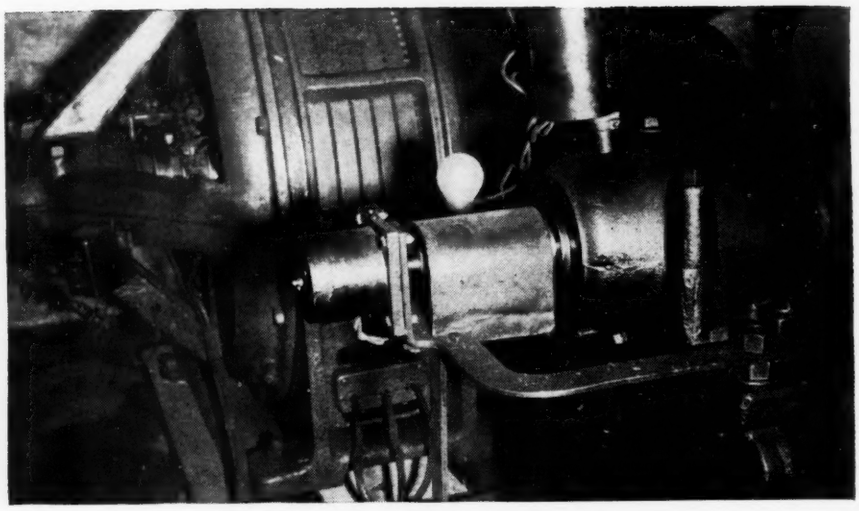


Where the substation operator sniffs the air exhausted by No. 1 fan. Note the drain pipe.

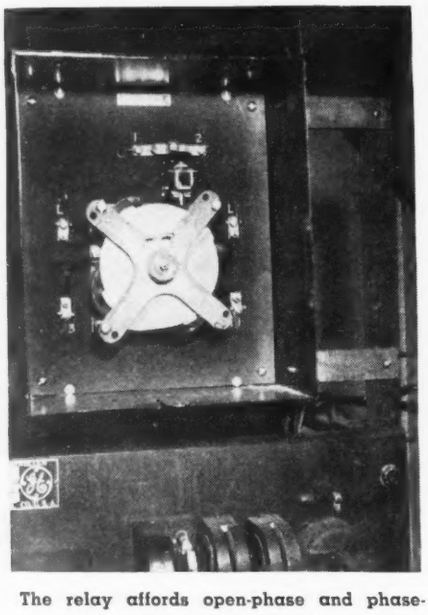


How wires to the spare motor for No. 2 fan are kept ready for attaching to the controls.

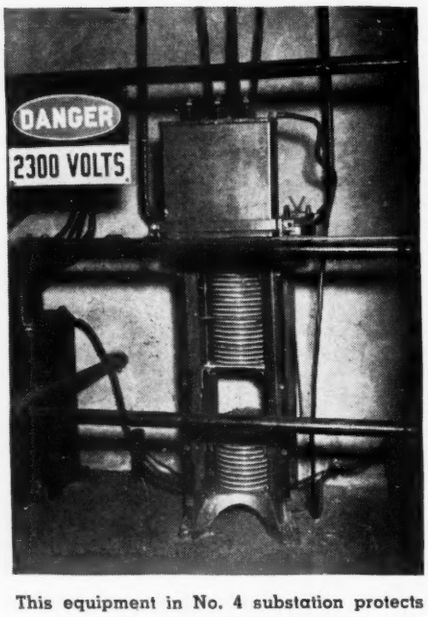
This building, housing No. 8 substation, has been moved and erected three times.



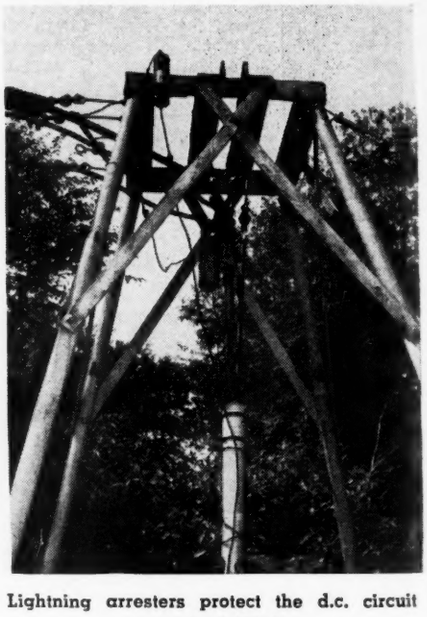
A contact-making device attached to No. 2 fan shaft blinks a light at No. 1 substation.



The relay affords open-phase and phase-reversal protection to No. 2 fan motor.



This equipment in No. 4 substation protects the m.g. set against lightning.



Lightning arresters protect the d.c. circuit at each drillhole.

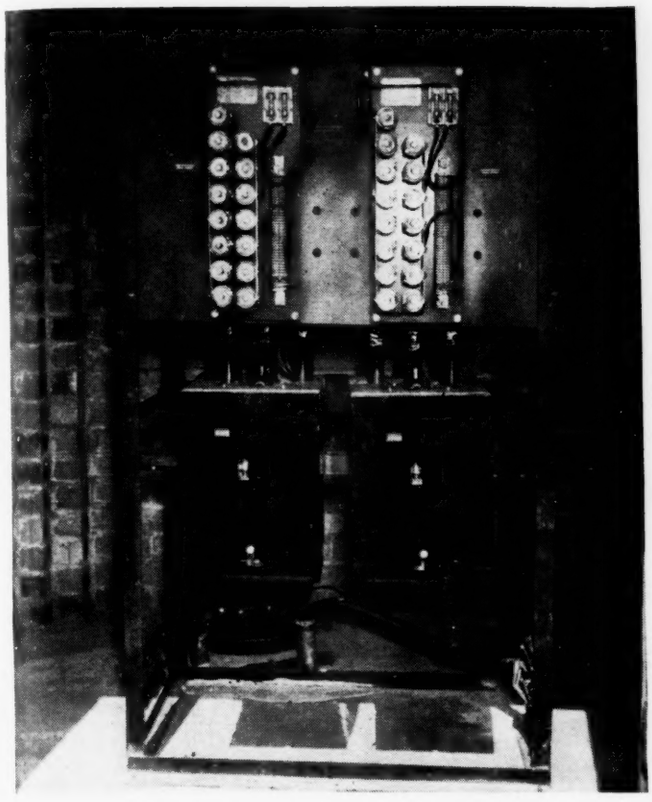
trifugal exhausting 115,300 c.f.m. at a 2.8-in. w.g. A 200-hp. 2,200-volt slip-ring motor drives this fan through ten V-belts. A 100-hp. motor is kept as a spare and a four-step starter serves whichever motor is in service.

The most recent fan installation is an 8-ft. Jeffrey Acrodyne installed in 1941 at No. 5 substation. This fan exhausts 77,000 c.f.m. of air at a 3.4-in. w.g. In this instance, a 100-hp. motor is direct connected to the fan through a Francke coupling and a two-step starter is used. A hoist at this 550-ft. shaft is provided for emergency use.

Many of the m.g. sets in the various stations are fully automatic. Others, started manually, are equipped with automatic reclosing equipment on the d.c. side. In the case of the full-automatic sets, when a ventilating fan stops, the protective interlocking equipment already mentioned shuts down the set and clears it on both the a.c. and d.c. sides. With the other sets, the d.c. side is disconnected as long as the substation operator at No. 1 substation wishes to hold it off. Some of the manually started sets are started Monday morning and run through the entire working week. However, they may not be feeding d.c. power to the underground circuit all the time. Most of the substation sets are housed in brick or stone buildings with concrete floors. There is, however, one exception. No. 8 is a portable Truscon steel building, now serving at its third location.

Devices ranging from tilting vanes operating contacts to a No. 848 Model C Mercoid pressure-vacuum switch are used to sound the alarm and send the electrical impulse to No. 1 substation, which quickly results in deenergizing the d.c. distribution system underground. Each fan has a pressure-recording instrument (seven-day chart) and a manometer for checking the accuracy of the instrument. Blinking lights at No. 1 substation, actuated by contact-making devices on the fan shafts, give the operator a visual check on the operation of the outlying fans at all times. Among other duties, the operator must go out of the building once each hour and sniff the air being exhausted by No. 1 fan. A special pipe is provided for the convenience of the operator and he records his observations on a form sheet.

As previously indicated, two of the fans have standby drives set in place. Extra belts are there to permit the spare unit to drive the fan from that position. Few changes are necessary to shift the



J. G. Pollock, electrical engineer, watches the load on the 150-kw. m.g. set at No. 7 substation.

These oil circuit breakers at No. 2 substation feed the 2,300-volt power to No. 3, No. 6 and No. 8 substations.

electrical controls from one motor circuit to the other. Having all wires phased out and labeled helps to keep the changeover time to a minimum.

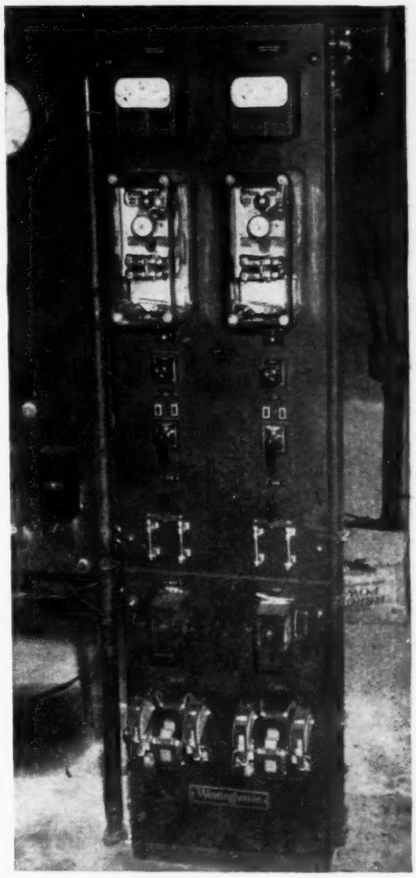
It is not unusual to find substation sets with open- or single-phase protection incorporated in their controls, but it is rather unusual to find such protective devices installed on fan motors. Just as fuses or some form of overload protection are necessary, so should an a.c. fan motor be protected against single-phase or phase-reversal operation. Now that more fan motors are protected by fused cutouts the need for single-phase protection is apparent. At this property, each fan motor is protected against both by a Type CR 2820-AK2A General Electric open-phase and phase-reversal relay.

Attention has been given to the protection of the rotating equipment in the surface substations and fan houses located at the extremities of the power lines against lightning. The latest type Thyrite arresters are installed along the 2,300-volt distribution system. For the protection of the a.c. rotating equipment in the stations, special station-type arresters and shunt capacitors are installed. These arresters limit the surge voltage to ground sufficiently to protect the insulation between the winding and the frame. The sloping of the surge wave front, affecting the insulation between turns, is accomplished by the shunt capacitor. Arresters also are installed on the tower above each drill-hole to protect the d.c. circuit against lightning surges.

All the 2,300-volt circuits fan out from No. 1 substation except for the two feeding No. 3, No. 6 and No. 8 substations. The latter are fed from No. 2 substation. To lessen the penalties from line disturbance, these lines have been sectionalized at No. 2. Oil circuit breakers, solenoid-operated, switch these circuits automatically. In the event of line trouble, usually attributable to stormy weather, either line will disconnect itself from the rest of the system. Reclosing equipment will make as many as three attempts at restoring service on the circuit before locking out.

At present, the output of prepared coal at Revloc No. 1 is about 3,500 tons in two shifts. Of this, about 45 percent, or 1,600 tons, is mined mechanically. To produce this, six mechanized units, each consisting of a Joy 14BU loader, two Joy 32D battery-operated shuttle cars and either a Jeffrey 29L or 29B track cutter, are double-shifted.

The officials and supervisors of the Monroe Coal Mining Co., with headquarters at Revloc No. 1, are: L. F. Crouse, general superintendent; L. H. Ripley, mine superintendent; Samuel Law, assistant superintendent; Thomas Coughlin, mine foreman; J. G. Pollock, electrical engineer; A. E. Roberts, chief mining engineer; and Frank White, master mechanic.



These controls help isolate the 2,300-volt lines feeding from No. 2 substation in the event of trouble.

STANDARD PLAN

Evolved for Loader and Shuttle-Car Work

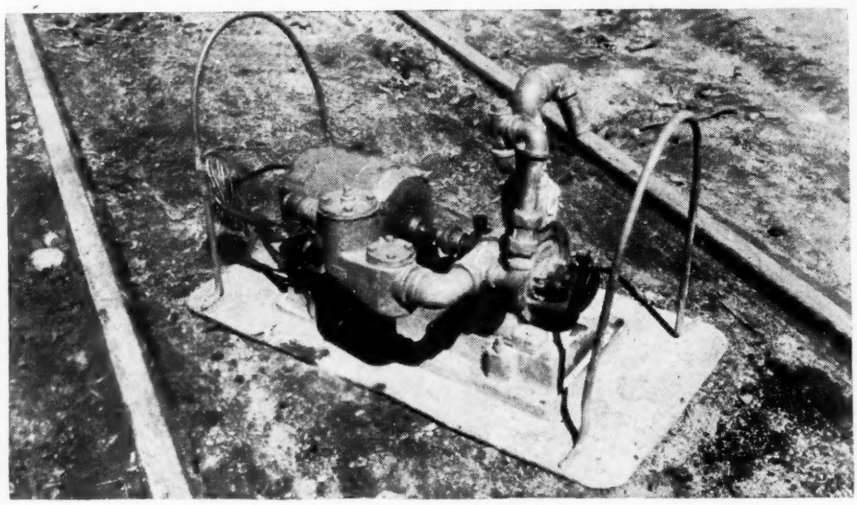
Experiments During Five Years of Production Make Possible Improved Mining System at Blaine, Using Loaders and Shuttle Cars—Efficiency and Safety Promoted by Better Handling of Water for Sprinkling Use

AFTER thorough trials of several methods and many variations during the five years since the Blaine (Ohio) mine of the Lorain Coal & Dock Co. was mechanized, officials have adopted a standard plan of face-entry development and room work that results in better efficiency under their conditions than any other combination tried heretofore. Shuttle-car hauls are limited to 350 ft. in face-entry development, except at the mouth, and to 550 ft. in room work. Loading machines are crawler-mounted and of the eleven shuttle cars in use eight are battery-operated and three have cable reels.

The mine is an old operation in the Pittsburgh No. 8 seam where the coal is 5 ft. thick and is topped with 12 in. of drawslade. General dip of the seam is about 1 percent and local grades seldom exceed 3 percent. Full seam loading and mechanical cleaning are the practice. Cover is heavy and, as it includes strata difficult to break, no pillars are taken. The bottom is a soft fireclay but the mine is fairly dry. No methane is encountered and line brattices seldom are necessary. The loaders are Joy 7BU, shuttle cars are the same make and the batteries are Philco.

Face and room-work plans are shown in separate illustrations. All headings and crosscuts are driven 9 ft. wide and the rooms are 26 ft. wide on 34-ft. centers. In developing face entries trips are spotted by a gathering locomotive without motorman. The brakes are partially set and the locomotive is controlled by energizing the trolley through a drum controller operated by the car trimmer. In room work a spotting hoist is used. It generally is set 300 ft. in by the elevator and 12- to 18-car trips are handled.

In driving the first 300 ft. of face entry the maximum shuttle-car haul (from "AA" on the drawing) is 550 ft., but from there the maximum haul is about 350 ft. Room entries, turned on 312½-ft. centers, are driven 212½ ft. from the elevator station on the face entry. Narrow work in the room entry includes two rooms of normal width and 80 ft. long in which tracks are placed for storage of supplies. Shuttle-car hauls in rooms range up to 550 ft.



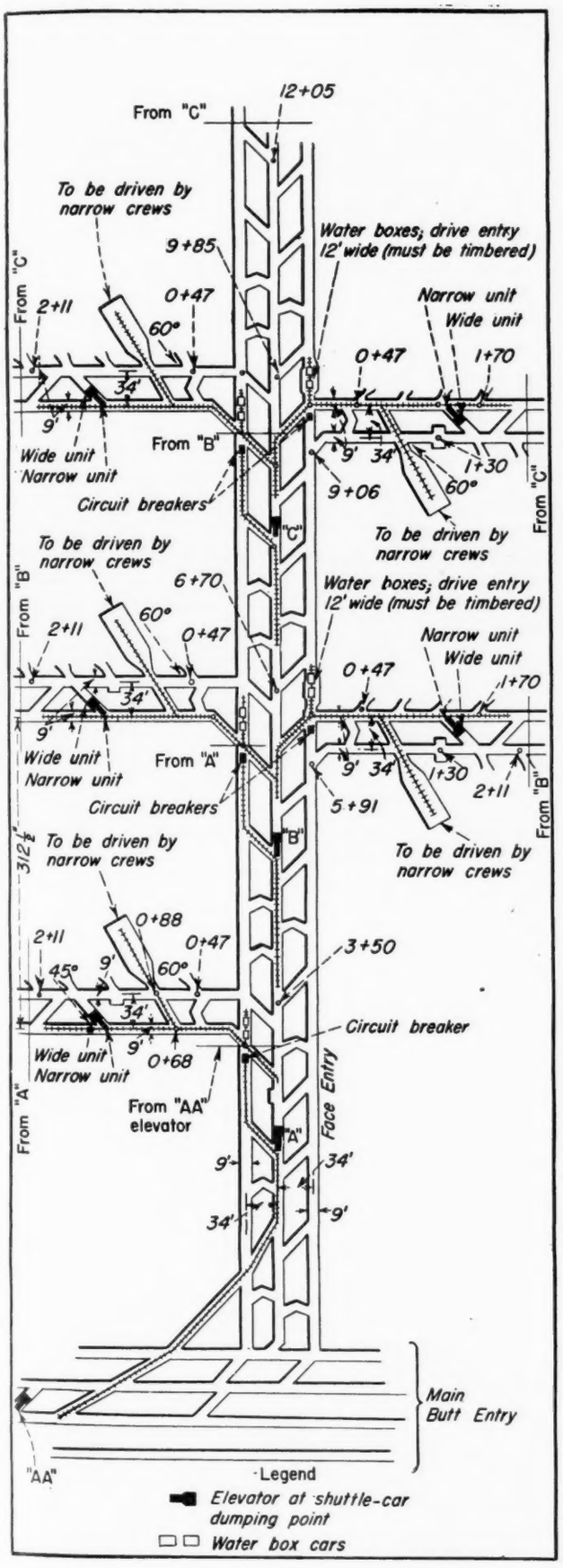
Portable pump for supplying hose lines to elevator sprays, bottom sprinkling connections and to barrels where shortwall cutter tanks are filled.

Use of water along the bottom on shuttle-car roads and on the cutter bars is a practice followed meticulously. From a mine-dewatering underground pumping station at the bottom of a borehole the water is hauled to the section in truck-mounted 4½ x 4½ x 10-ft. water boxes. These are parked in pairs. Water is drawn from one at a time and as soon as one is empty it is replaced with a filled one. Consequently, there never is an excuse for the section operating without water. Boxes stay in one location near the elevator during both development and room work. At that point a centrifugal pump operates continuously to maintain pressure on hose lines to spray points.

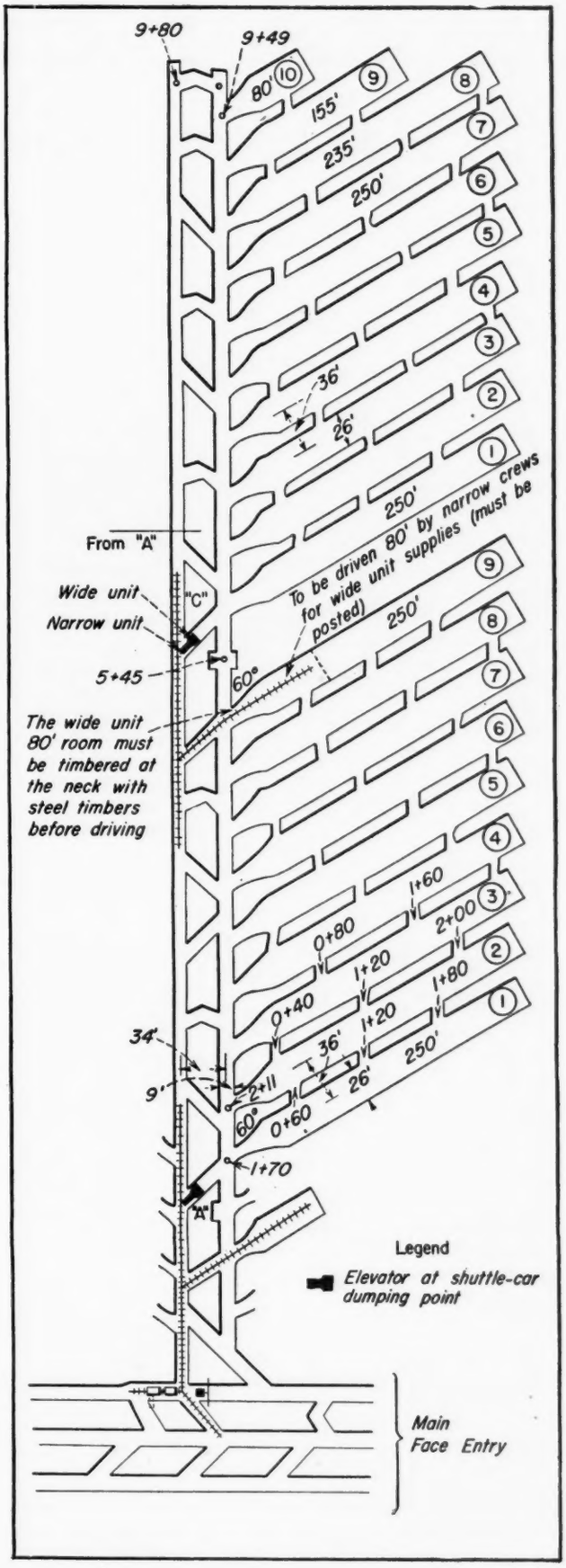
This pump, a portable American Model D4 self-priming bronze unit rated 5 g.p.m. at 40 lb. and 4 g.p.m. at 45 lb., was assembled by the Interstate Pump Co., Wheeling, W. Va., to specifications of the coal company. It is driven by a Westinghouse ½-hp. 1,750-r.p.m. 230-volt d.c. motor. A bypass relief value on the unit comes adjusted to 45 lb. but the setting is changed in the mine to suit the length of hose.

The water boxes on the main entry serve the whole panel of rooms. From those boxes the water line up the straight or tracked heading to the elevator is a 1¼-in. hose. From there ¾-in. hose is carried as far as 400 ft. to barrels that the shortwall cutters pass when moving to the next place. At the barrel an 11-gal. tank on top of the motor box of the cutter is refilled. This quantity of water, pouring onto the ingoing cutter chain, is used up during one cut. The ¾-in. hose lines also supply water for sprinkling the bottom over which the shuttle cars travel.

Production of Blaine mine is 2,700 tons of washed coal per day, operating two underground and two tipple shifts. E. G. Schell, general superintendent, has been in charge at the mine since mechanical loading was installed. S. B. Johnson is president of the company and L. J. Lorms is general manager. Arnold Schell is general mine foreman and Marshall Schell is superintendent of maintenance.



Development plan for face entries driven with crawler loaders and rubber-tired shuttle cars.



Working plan for room entry and rooms worked with loaders and shuttle cars.

MODERN FACILITIES

Include Underground Toilets at Hayden

Equipped for Efficient Mining With Shakers and Modern Auxiliaries, New Hayden Mine Also Includes Six Underground Toilets — Power Distribution System Designed for Maximum Service to Producing Units

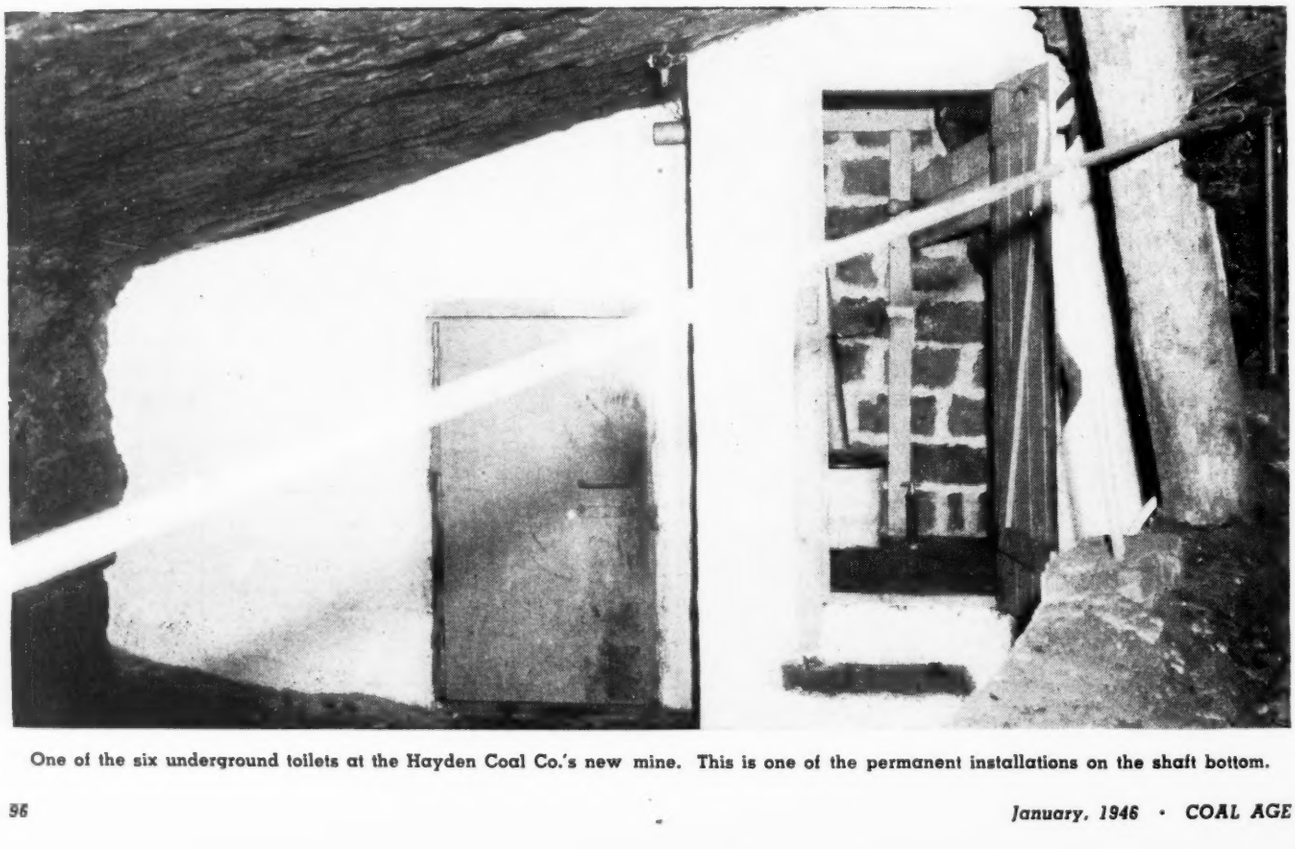
By G. R. HARRIS
General Manager, Hayden Coal Co.
Denver, Colo.

And CHARLES H. LAMBUR
Assistant Editor, Coal Age

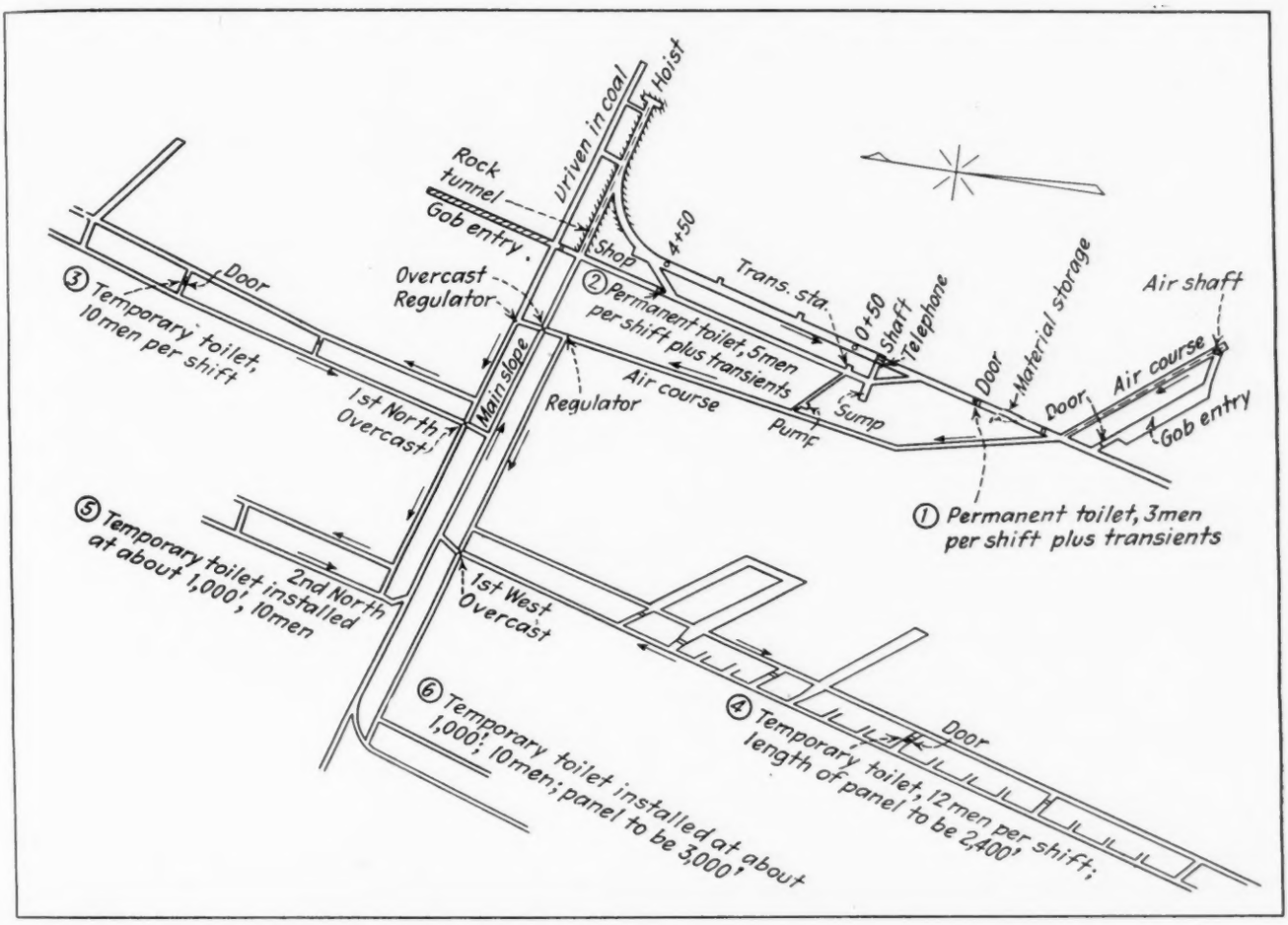
UNDERGROUND sanitary toilets supplement modern mining methods and equipment at the new mine of the Hayden Coal Co., Haybro, Colo. The keynote of this new shaker conveyor operation has been efficiency and cleanliness, which the toilet installations carry out by eliminating use of mine workings for calls of nature and the work delays that result. The men are well pleased and the State Department of Mines is enthusiastic.

Now in the development stage, Hayden mine operates in the third seam of the Pinnacle series, 9 ft. 6 in. thick and pitching 20 percent. The operation is served by a hoisting shaft and an inside slope consisting of the slope proper and a parallel airway on each side. Panels are turned at right angles to the slope and are developed by two shakers each. Timbering on the shaft bottom consists of concrete legs supporting 10 in. I-beam crossbars on 9-ft. centers, upon which are laid 20-lb. rails with 3-in. lagging. Main haulage track consists of 60-lb. rail on 6x6-in.x5-ft. creosoted fir ties. The loaded tracks in the panels consist of 40-lb. rail on red spruce ties with rock ballast. Empty tracks in panels, same ties and ballast, are laid with 30-lb. rails.

Stoppings are cinder block plastered with cement and painted white. Overcasts are the same except that reinforced concrete is used with the cinder block. All doors are steel. A Vulcan Iron Works 200-hp. 2,300-volt hoist (1⅛-in. rope) is employed on the underground slope. The hoist room is reinforced concrete and large enough to permit disassembly of the entire hoist. The resistance is housed 50 ft. down the slope from the hoist room. Mining equipment consists of seven Goodman G-20 shakers, seven Sullivan 7-B cutters, nine Jeffrey A-6 drills, three Westinghouse-Whitcomb 8-ton battery locomotives, six Sullivan car puller (crab) hoists, seven Jeffrey Acrovane blowers and miscellaneous pump and shop equipment. All motors are 440-volt permissible and the management has taken special pains to provide an efficient 2,300-volt underground power distribution system (described later in this article).



One of the six underground toilets at the Hayden Coal Co.'s new mine. This is one of the permanent installations on the shaft bottom.

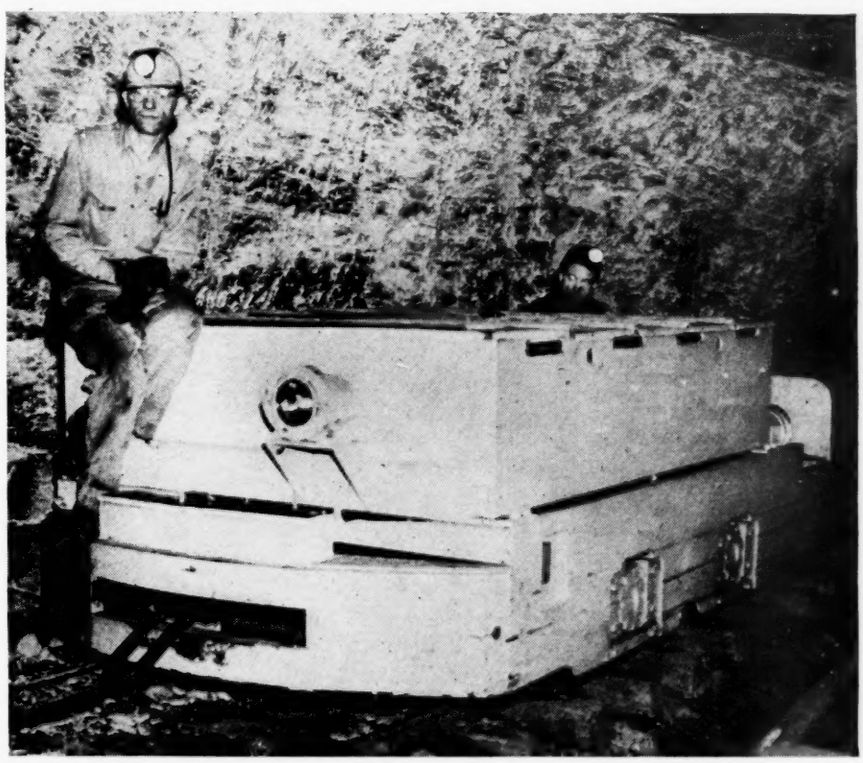


Development at the Hayden Coal Co. operation showing plan of operation and locations of the underground toilets. Nos. 1 and 2 are permanent. The other four are temporary units that are moved regularly to keep them close to the workings.

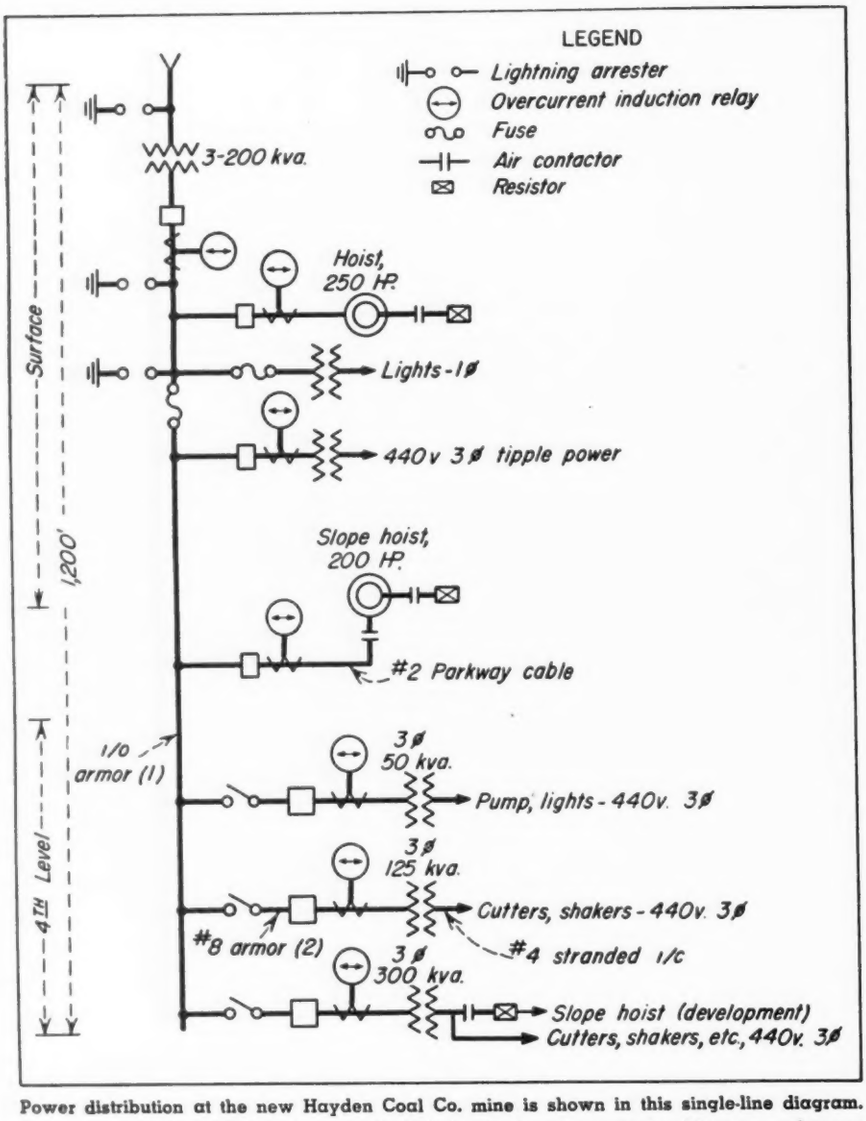
Toilets are single-bowl San-Equip No. 580-B waterless units. Each installation consists of a vitreous china bowl and non-split seat, an 80-gal. copper-bearing iron storage tank 22½ in. in diameter and 48 in. long, waterproofed inside and out by a coating of mineral asphalt, an agitator, galvanized ventilation pipe with roof flange and vent pipe and a chemical charge of San Solvent. Total weight is about 275 lb.

Two styles of tanks are available: Type V, with a simple pressure-closing drain valve, and Type T, with no drainage outlet. Both are in use: Type V where the installation is on a slope, as in the panels, and Type T where the installation is in a level passage, as at the shaft bottom. The V type is preferred because it is readily emptied by the drainage outlet whereas the T type is emptied by pumping or bailing out the contents through the manhole. Tanks are emptied every six weeks or when full. Toilets with capacity ratings of from 4 to 200 persons are made. Those in use at the mine are rated at twelve persons each, which is sufficient for the personnel in a panel.

Spotting the toilets is based upon



One of the 8-ton battery locomotives handling haulage on panels.



Power distribution at the new Hayden Coal Co. mine is shown in this single-line diagram. Power is carried at 2,300 volts through lead-sheathed and armored cable to transformers producing 440 volts. All motors are permissible.

Power-line installation and stopping at Hayden Coal Co.'s new mine.

their capacity and where they can be most readily available. There are two permanent and four temporary installations in use. One permanent unit is at the shaft bottom and the other in the shop and material storage area. Each bowl is set on a concrete platform over the tank. The walls of the room are cinder block, stuccoed and painted white. Doors are wooden but in the future will be steel. The vent is located next to the roof and empties into the exhaust airway. Temporary installations, one per panel, are set up with the toilet bowl on a wood floor over the tank. Room walls are 1x12-in. wood. These toilets are erected as closely as possible to the active workings and are moved accordingly.

Good Power Sought

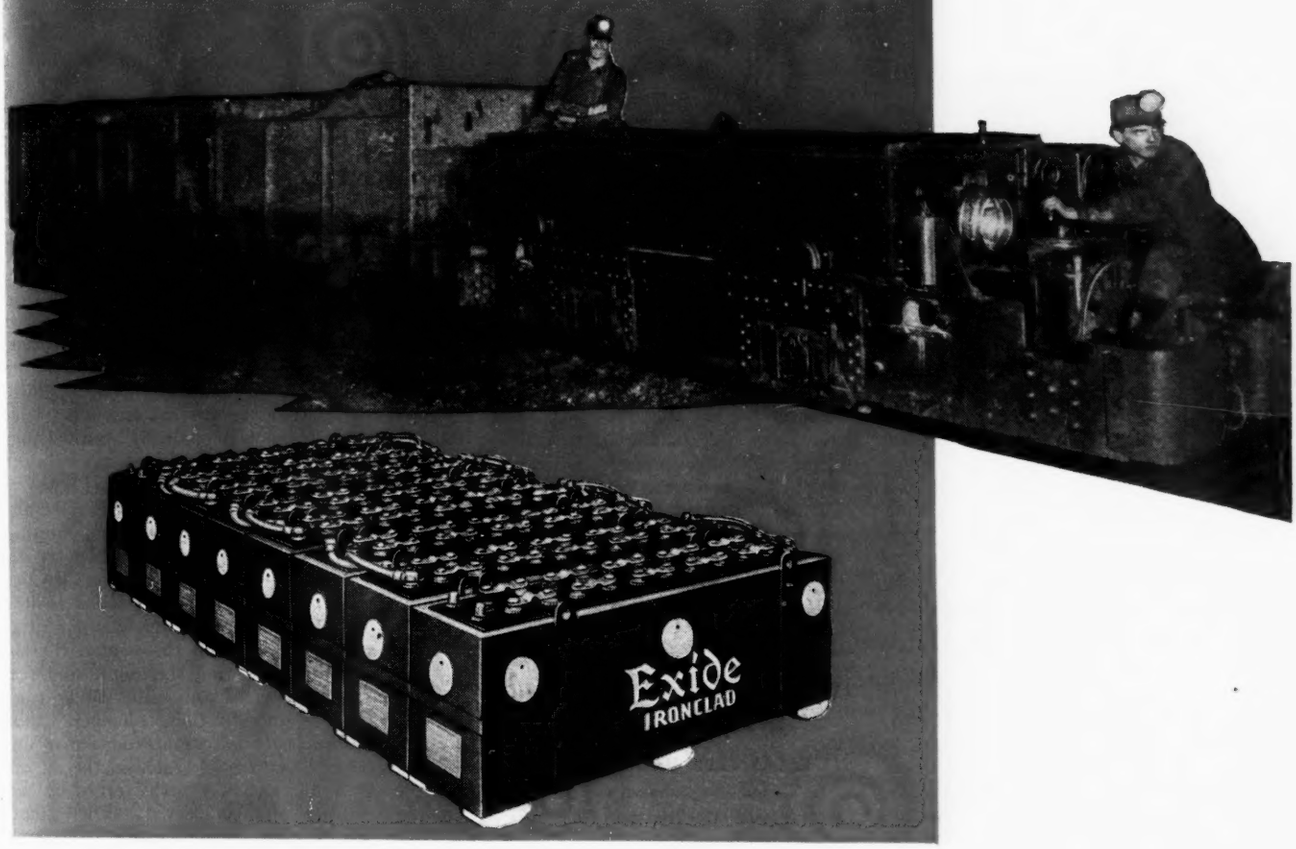
Carrying out the principle of efficiency in all departments, special attention also has been given to underground power distribution. Power at 2,300 volts a.c. is carried into the mine down the shaft and through the main aircourse by means of Anaconda 1/0 three-conductor 3,000-volt copper cable with 8/64-in. lead sheath and No. 8 steel round wire armor. At the shaft bottom a 50-kva. Westinghouse transformer provides 440-volt power for the operation of pumps, shop equipment and lights. Crouse-Hinds gasproof Type RMC-8 inclosed lamp fixtures on 18-ft. centers are employed for illumination throughout the shaft bottom.

From this substation the cable passes through the aircourse to a junction box at the top of the slope and then on down the aircourse. A 300-kva. Westinghouse air-cooled transformer is placed at the end of the entry to provide power for all development work. An Anaconda three-conductor No. 6 stranded VCLJW 5,000-volt No. 8 BWG armored cable branches off to the working panel, transmitting 2,300 volts to a Westinghouse 125-kva. air-cooled transformer. From this power unit three single-conductor wires are carried along the panel to provide 440-volt power for room work, battery recharging, etc.

All armored cable is hung 12 in. from the roof on 1-in.-diameter galvanized pipe driven 18 in. into the sandstone. The hangers are set on sights. The arrangement of pipe clamp, insulator and pipe hanger acts as a safety device since, in case of a rock fall, the cable will swing sidewise and not be buried. There is an oil switch at each junction point in the cable system and in case of trouble the section affected may be disconnected while the remainder of the power distribution system remains in use.

POWER

EXIDE-IRONCLAD POWER ASSURES LOWER HAULAGE COSTS PER TON



The increased production and greater economy that result when haulage units are Exide-powered, are due to many factors. Chief among them are a *high power ability* which meets the increased kilowatt demands encountered in frequent "stop and go" service . . . a *high capacity* which keeps shuttlecars, locomotives and trammers operating at sustained speeds throughout each shift . . . and a rugged construction that reduces maintenance close to zero.

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The Foremen's Forum

Why Intakes and Returns Rarely Carry Same Volume of Air

In Shallow Workings With Exhaust Fan, Leakage of Air From the Surface to Intake Usually Is Beneficial, but Detrimental When Return Is Thus Connected to Surface

RARELY IN MINES operating in beds near the surface are the volumes of air carried by intake and return nearly equal, for usually there is leakage through breaches of the surface near coal outcrops. Other factors also affect the quantity of air entering and leaving the mine. Sometimes air is being stored; sometimes it is leaving storage; sometimes the mine is generating gases and sometimes it is absorbing them; often it is doing both. Sometimes the air is being heated by the mine, sometimes it is being cooled. At times the air is accumulating water vapor; at other times the mine is receiving the air's excess moisture. Sometimes the outside air is at a higher pressure than the inside air and sometimes this condition is reversed. All these things and the location and travel of trips in the headings modify resistance and make the relative volume of air flow change from time to time in various parts of the mine.

Why Air Volume Changes

Some the changes in volume are relatively controllable and some are relatively uncontrollable. Of the four relatively controllable changes, two are helpful and the other two harmful. Other changes are regulated by nature and have been listed as relatively uncontrollable.

(1) *Relatively Uncontrollable Changes in Volume*

1 (a). *Due to Contrasted Internal and External Temperatures*—The volume of air will be greater in the intake than in the return if the air entering the mine is cooled by its passage through the headings. It will be greater in the return than in the intake if the air entering the mine is warmed as it passes through the workings.

1 (b). *Due to Increase in Methane Content*—The volume of air will be greater in the return than in the intake if methane from the coal measures enters the mine. This increase will not be proportional to the quantity of methane in the air as determined by its analysis, for the quantity found by analysis depends not alone on the quantity of methane liberated from the coal measures but on the quantity also that is freed from the goafs by the expansion resulting from low pressure on the earth's surface. The increase in volume from evolved methane will tend to be constant, but it will be greater when the mines are working than when they are idle, because at such a time more methane is liberated, and for the same reason it will be greater during periods of steady operation than during periods of idleness or abandonment, when the air is not broken by mining.

VARIATIONS IN VOLUME OF INTAKE AND RETURN

(1). RELATIVELY UNCONTROLLABLE and Independent of Fan Type by Reason of
- **(a) Contrasted Temperatures**
- **(b) Increase in Methane Content**
- **(c) Increase in Carbon Dioxide**
- **(d) Contrasted Moisture Content**
- **(e) Reduction in Oxygen Content**
- **(f) Change in Atmospheric Pressure**

(2). RELATIVELY CONTROLLABLE and Dependent on Fan Type by Reason of Passage of
- **(a) Surface Air Into Intake**
- **(b) Surface Air Into Return**
- **(c) Intake Air to Surface**
- **(d) Return Air to Surface**

1 (c). *Due to Changes in Carbon Dioxide*—Carbon dioxide escaping from the coal bed increases the volume of air, and more is evolved than is absorbed, as is indicated by the fact that goafs contain large quantities of carbon dioxide evolved from the coal. On the other hand, 1 volume of methane and 2 volumes of oxygen when burned make 1 volume of carbon dioxide and 2 volumes of water vapor and, if the water vapor condenses, 3 volumes of a mixture of methane with oxygen make 1 volume of carbon dioxide, so there is a shrinkage due to the burning of methane, and the carbon dioxide thus generated decreases the volume of mine air and thus shrinks the return a little.

1 (d). *Due to Contrasted Moisture Content*, as measured in actual content, not in percentage of saturation. These changes, when the air is cooled by the mine, occur mostly near the mine mouth. There the moisture falls as dew, and the air loses volume. When the air that enters is cooler than the mine it is gradually warmed and absorbs moisture, increasing its volume. Moisture changes, therefore, may rise or lower the proportion of return to intake air. In the summer, the air is cooled on entering the mine, so the air may not be able to retain all the moisture it has been carrying. The return accordingly tends to be of less volume than the intake, by reason of the moisture abstracted. In the winter, the air is warmed on entering the mine, and the reverse condition obtains. But other conditions may modify these changes. Subbituminous coals and lignites also may deliver large quantities of water to the air on its way to the face and to the return, as the air is warmed and can carry it. Where these unmatured coals occur on this continent, the air usually is so dry, however, that it is almost always thirsty.

Oxygen Is Abstracted

1 (e). *Due to Reduction of Oxygen Content*—If all other causes were suspended, this cause—reduction of oxygen content—always would tend to make the volume escaping from the mine a little less than the volume entering it.

1 (f). *Change in Atmospheric Pressure*—When the pressure of the surface air increases or, in other words, when the barometer rises, the air in the mine is compressed and less air escapes to the surface than enters at the intake. In consequence, the flow of air in the return decreases, and more air enters than passes out on the return. So, air is stored in the mine. When the barometer falls, and the mine air expands, the return has to handle more air than the intake supplies. Thus, the stored air is released; the mine is unloading.

(2) *Relatively Controllable Changes in Volume*

2 (a). *Due to Passage of Surface Air Into Intake*—With an exhaust fan, surface

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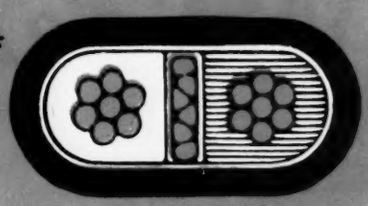

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air may be entering through crop holes, as at points marked A in the illustration. In some mines, almost every room will have one or more crop holes and some crop holes may extend over the width of several rooms. The air that thus enters, if it goes to the working face, will carry air to that place without causing any congestion of air at points outby the point where such air joins the planned intake. In the sketch, note the arrows emerging from the two crop holes on the right, which show air entering the working directly at a working face. As all this air probably will not be reckoned as forming part of the intake air, the return air will appear to be of greater volume than the intake air.

Where this air has been leaking in this manner for some time, its passage through rooms and goafs probably will not contaminate it, so it will be as pure and desirable as the main intake, which, as it travels past several goafs and rooms, may acquire when the barometer falls quite a percentage of noxious gas. For in passing through rooms and goafs this air will clean much methane and carbon dioxide out of these workings, active or abandoned, and do it steadily 24 hours of every day instead of only during a period marked by a falling barometer or even only during a period having a very low barometer.

Air Slips Into Return

2 (b). *Due to Passage of Surface Air Into Return*—With an exhaust fan, air may enter into the return through cavings and crevices along the outcrop, as at the points marked *B* in the illustration. Sometimes, this causes large increases in the volume of return air, and this air, entering into the air current too far along in its travel to ventilate the active workings, serves no purpose whatsoever and merely chokes the return. Fortunately, the air that thus reaches the return usually has no great distance to travel, but it makes the distance it does so travel an important bottleneck and thus slows the entire circulation.

Observation, both inside and outside the mine, to detect the entrance or the opportunity for entrance of such air is highly essential. Outside the mine, the sides of cavings can be dynamited, and the holes thus closed, or some material can be bulldozed into the holes. At times in the winter, the entry of air from the surface into the return can be detected inside the mine by a man patrolling that airway. He will note a decrease in temperature where the air enters. In the summer, a rise in temperature will be apparent if the leak is not too far distant from the return into which the air ultimately enters. At all times, the increased purity of the air will indicate leakage. There will be a relative freedom from fumes after shooting, an invigorating freshness and a reduction in the density of the dust cloud.

Such observation must be followed by a speedy closing of the openings, because leakage into the return cannot be tolerated, though a leakage into the intake may be not only permitted but encouraged, though it will be more than inconvenient in case of a mine fire or an explosion unless the holing furnishes a safe point of exit or entry for the escape and recovery respectively of entrapped persons.

2 (c). *Due to Passage of Air Intake to Surface*—When the air is moved by a force, pressure or *plenum* fan, the pressure in the mine is raised above the surface pressure, and the air leaves the mine by every available opening. If the air leaves along the intake, it may be lost to the surface before it has done any work, though it can be arranged so as to accomplish a full stint before it escapes, or it can be shut off entirely if so desired. With pressure equipment, the outcrop and its openings must be watched.

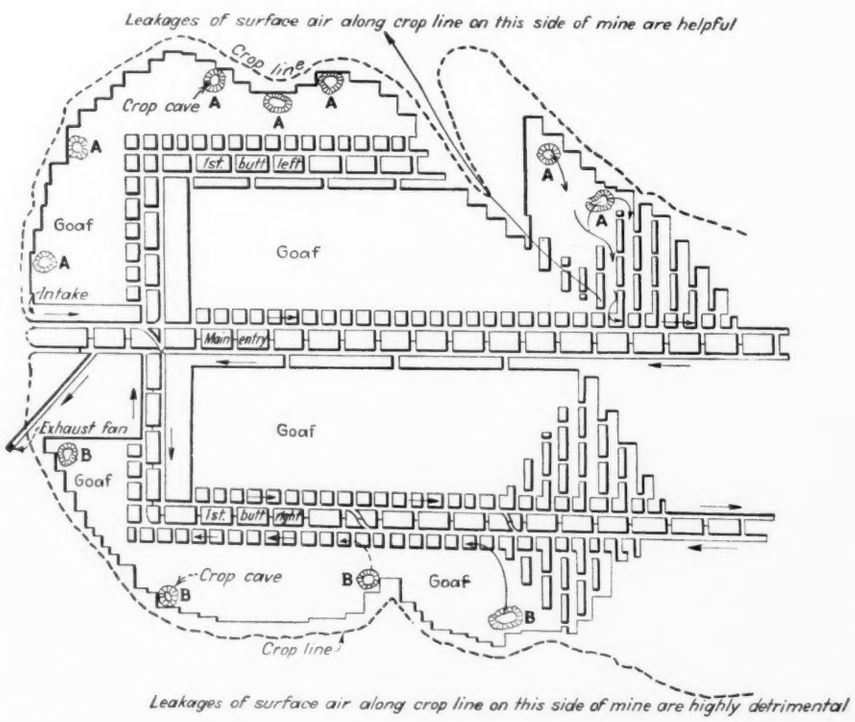
Air Leaves by Outcrop

2 (d). *Due to Passage of Return Air to Surface*—With a pressure fan, the leakage to the surface will be advantageous on the return side, as it will shorten the travel of the air, which has already performed its work. The pressure drives the air out completely and not only is a bottleneck avoided but the entire work of making the return travel beyond the point of escape is eliminated. Where there is leakage, a pressure fan always is desirable, for it drives methane and carbon dioxide to the surface, and it will be helpful on the return side and may be helpful also on the intake side if properly controlled. Workings from a heading approaching the surface will have their air traveling toward the far end of the heading so the haulage, which is at the rear end of the heading, will be on the intake.

Of course, the quantity of air leaving the mine increases when trips of cars, especially loaded cars, travel in the direction of the air current and conversely decreases when the trips travel in the opposite direction. Moreover, the closing of doors passes the air to entries that temporarily were not ventilated and that fact increases resistance and so reduces the gross volume of air passing. The presence of cars in the roadways, whether moving or stationary, also increases resistance and decreases the passage of air. In consequence, the measurement of air in the intake and in the return should be taken at the same time and when the mine is idle, if a clear idea of relative conditions in intake and return is desired.

Reduces Air Resistance

With exhaust ventilation, air that enters the mine on the intake side will give easier access to the active workings and reduce the resistance of the air current, thus increasing air volume. Such air as enters on the return side ventilates usefully only the goafs (probably in little or no need of ventilation, being methane-free because of their nearness to the surface), increases resistance and reduces air volume in the workings. Leakage is a more important consideration than less controllable factors, and it can be helpful at times as well as harmful at others. With a pressure fan, air is returned by the external atmosphere to the fan as electricity is returned to its generator through the ground. Resistance of the mine perimeters and regulators is used to control, as desired, the distribution of the medium of ventilation as the resistance of conductors, load and grids is used electrically to distribute the medium of power as need dictates.



With exhaust ventilation, air that enters the mine on the intake side will give easier access to the active workings and reduce the resistance of the air current, thus increasing air volume. Such air as enters on the return side ventilates usefully only the goafs, increases resistance and reduces air volume in the workings.

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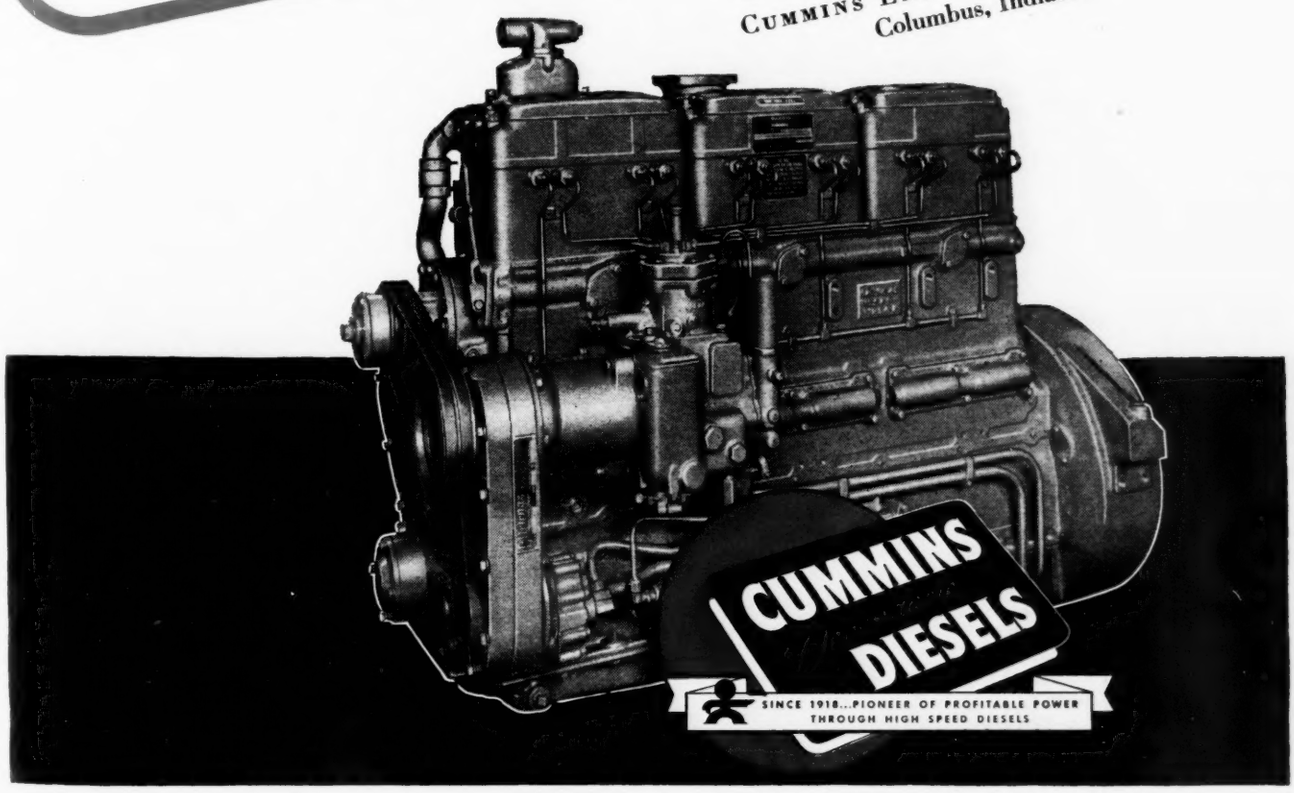


State-Board Questions

Mine Foremen, Ohio

Multiplier for Friction

Q.—What is meant by the "coefficient of friction"?

A.—This seems at first sight to be an odd expression that never should have been coined. One never hears of a "coefficient of length" or a "coefficient of cross-sectional area." Instead say "length" and "cross-sectional area," and it seems similarly we should say "friction" and then designate what area causes that much friction. In this case, that area usually is described as "one square foot of rubbing surface," but that really is not a fact, as will be seen later. However, we will suppose that this is just what in discussing mine ventilation the "coefficient of friction" really means. (It should be, by the way, "coefficient for friction" or "friction coefficient.")

Why We Don't Term It Specific Resistance—If it were merely friction per square foot of surface, it would be better to term it "specific resistance" or "unit resistance," the resistance of a single square foot to the passage of air over its surface. When you multiply the area in square feet of the walls, floor and roof of an airway by the resistance of a single square foot, you obtain the total resistance of the periphery of that airway.

However, all this is too simple to be true, and the author of the expression "coefficient of friction" never so regarded it. He took the area of the surface that would have been exposed in the heading walls, roof and floor if those walls had been straight and regular, multiplied that figure by the square of the velocity of the current and divided the result by the area and got a figure that had to be multiplied by some other figure he termed the "coefficient, or multiplier, of friction" to obtain the pressure on the air current that was passing through the mine.

Coefficient, Though Appearing to Be Based on Area, Involves Other Resistance—The mine he took had timbers in its roadways and bad turns and friction not only of the air on the periphery but of the air within the periphery, and the figure he got was much higher than would be given for a cleanly walled, roofed and floored airway. So he did not term his multiplier the "specific, or unit, resistance" but the "coefficient," or "multiplier," for that mine as based on what he knew was an erroneous computation of its rubbing surface, and on a total disregard of the frictional resistance within the peripheral limits.

We have the same difficulty as he had, and we do well to call it the "coefficient for resistance" because it is the actual resistance multiplier based on the usual incorrect estimate of rubbing surface. It is commonly designated as *k*, which is an abbreviation for "coefficient." The figure naturally will vary with the mine: how slick are the walls? how rough are the tracks? how broken is roof of the airway? how straight are the roadways? etc.

Some, with W. Fairley, make the coefficient decimal seven naughts and a one = 0.00000001, or one divided by one and eight naughts. Some investigators would make the figures 117 percent larger, some only 23 percent as large. Mines with gob headings, heavily timbered roadways with many roof pockets along the road and many traveling mine cars in the low roadways of thin seams do well to take a high figure. But air sometimes travels through the rooms and the goaf, decreasing the resistance. The best way is for every mine to estimate its own value of *k* and take no one else's word for it. It varies with the age and condition of the workings. The older the workings usually, the higher coefficient chosen.

Coal Age Quiz

Pros and Cons of M-G Sets

Q.—What are the advantages of the motor-generator as used in the mines?

A.—Motor generator sets are best suited to a steady demand for power or, as we say, an even load. They are very inefficient when carrying only a fraction of their full capacity. In typical mine installations, they are only 72 percent efficient at 20 percent of full-load current. In contrast, a rotary converter will show an 84 percent efficiency at that rate of loading. However, motor-generators are often favored over rotary converters because:

(1) *They Correct Power Factor*—The synchronous motor used in such sets corrects the power factor of the power line, which before capacitors were introduced to effect this same purpose, used to be a powerful argument. In general, power factor can be corrected by capacitors at less expense in first cost than by introduction of motor generator sets. Capacitors perform this service well for they have an efficiency of 99.75 percent. They can be installed just where the power factor is low and needs correction, often greatly reducing the quantity of copper needed for transmitting current, because their effect is helpful, not only at and beyond the capacitor but also at the main generator.

(2) *They Give Required Voltage*—The voltage of direct current delivered to the lines by the motor-generator set does not vary with the power-line voltage as does that voltage when a rotary converter or rectifier is used. With the motor-generator set, the voltage of the direct current is fixed regardless of slight variations in the voltage of the alternating current of the power line, which always drops when the load is heavy. Less current will flow but what current is obtained is of full potential.

(3) *They Can Be Overcompounded*—When the load increases and higher voltage is needed, the motor-generator set may deliver temporarily 10 percent more voltage than such a converter, provided that (a) it is so designed that it can be "overcompounded" and provided also that (b) it is not operated in parallel with a rotary converter, for by its construction a rotary converter can never be overcompounded. But the increase of power above rating is obtained at the hazard of overheating the set.

(4) *They Are Easily Started*—In starting, the motor-generator set is "less temperamental" than the rotary converter.

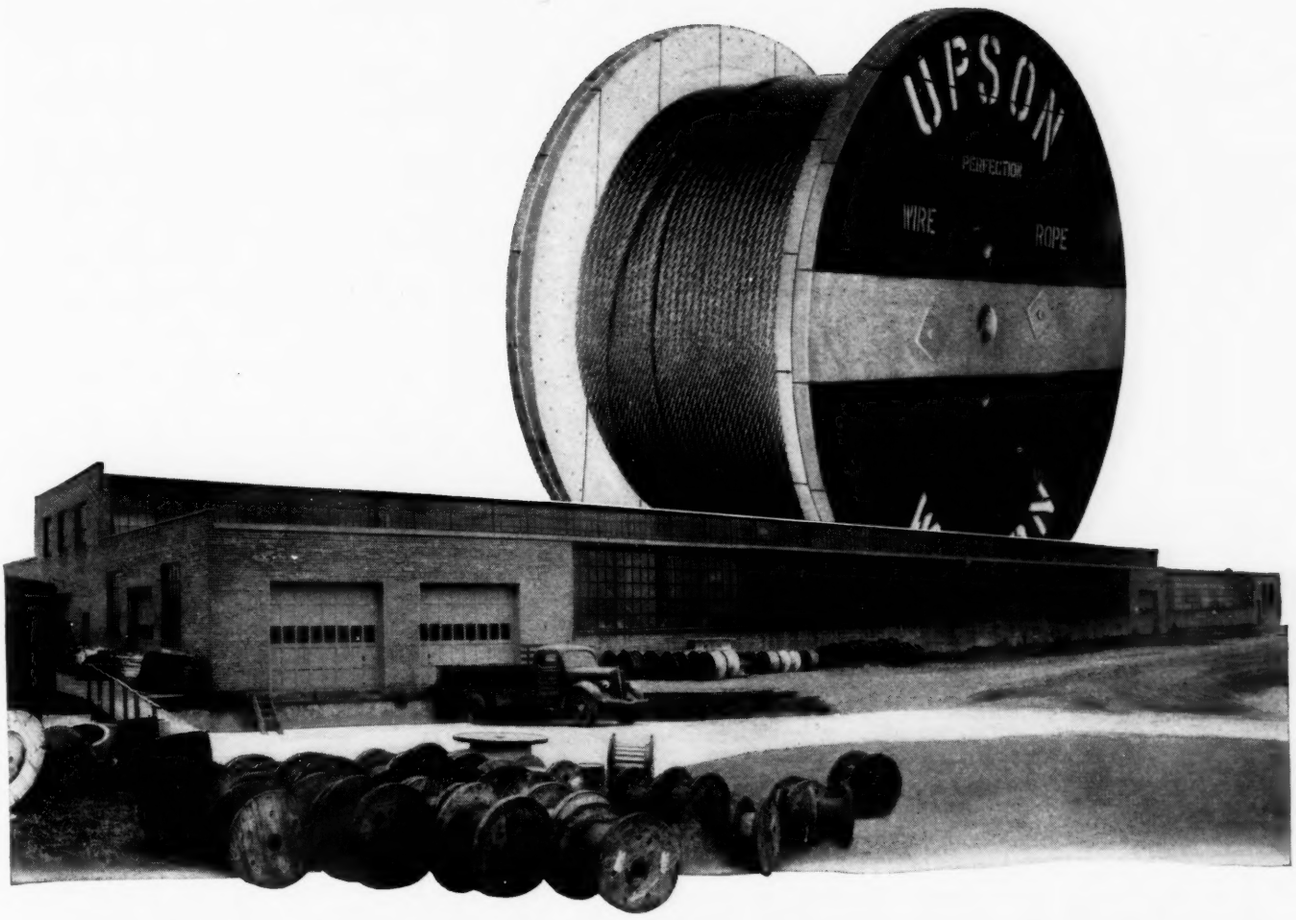
It may be noted that any unit whether motor-generator set, rotary converter or rectifier is designed to carry for two hours a load of 50 percent greater than its rating or for one minute 100 percent greater.

Small types of motor-generator sets are well suited to and are used for charging storage batteries. The motor-generator set is a heavier piece of equipment to move around and more expensive than a rotary converter, but the rotary converter has to have a transformer. Thus, as regards weight, bulk and cost, the difference is inconsiderable.

Anode Is Energy Outlet

Q.—What is an anode and by what sign is it indicated?

A.—The lower-potential terminal of a conducting path through a rectifier or an electroplating unit is called the anode. Correctly speaking, it ceases to be an anode if the direction of the current is reversed. It has always been indicated with a plus sign. This still remains true, though scientists now tell us we have been mistaken in be-



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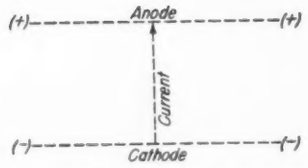

Current flows from Cathode to Anode

Fig. 1—Current flows from cathode to anode.

lieving that electricity travels from the positive to the negative terminal.

It travels, the physicists say, exactly in the opposite direction; that is, from negative to positive. It used to be described, and still is, as traveling from anode to cathode. Sometimes even those who are recognized as electrical authorities and admit that they know better, declare that current runs from positive to negative terminals saying in defense that they consider it best to continue to follow the time-honored convention at least when dealing with motion, windings and magnetic fields.

In electronics, it is different, they admit. We have known for some time—at least for the short time during which rectifiers have been used—that the current went from cathode to anode. Now we think we know why. But to change our conventions in regard to motors and generators is they think, upsetting customs over a century old, and probably they are right. When we discuss an electronic device like the rectifier we will be in accord with both fact and custom if we deal with the subject in the modern way.

Muddling Magnetic Poles—The muddle is like that in the use of the expression "north pole of a magnet." The pole of the magnet that swings around in the direction of the North Pole of the earth should really be termed the south pole of the magnet, for dissimilar (or unlike) poles attract and similar (or like) poles repel each other. The pole that we term the north pole of the magnet should correctly be termed the "north-seeking pole." We have our language in reverse when we say the north pole of the magnet is attracted by the North Pole of the earth (see Fig. 2).

Unfortunately, we talk about the poles in English, but, after all, the damage done by such false nomenclature is not considerable, and as we have named the terminals in Greek, and as few mechanical engineers know Greek, terming the outgoing terminal the "anode," a word that means "in-way," "inlet" or "entrance," does little harm, for we can easily forget that the names are transposed and use the word "cathode" for inlet and "anode" for "out-way," "outlet" or "exit" without raising any uncomfortable questions in our minds.

Physicists have been delving into the mysteries of the atom, and they now tell us that electrons—those mysterious bits of matter which revolve around a group of "nucleus" of protons and neutrons, of number dependent on the kind of atom, and are so small that 1,840 of them are only as heavy as the lightest of the protons, the hydrogen proton —always carry only negative charges of electricity. It is their travel, as they jump from atom to atom that makes the electric current, and therefore that current travels from minus to plus.

Cathode Still Negative

Q.—What is a cathode and with what sign may it be indicated?

A.—The entering terminal of a conducting path through a rectifier tank or an electroplating unit is known as the "cathode." It is often indicated by a minus sign. The current flows from the cathode to the anode. By a misinterpretation of signals, scientists have regarded the cathode as the "exit," "outlet" or "out-way" and named it accordingly by the Greek word "cath," meaning "out," and "odos," "way," but it now proves to be the way *into* the rectifier tank or electroplating unit, and not out of it, so its naming is misleading.

Use, Arrows, Not Signs—The use of plus and minus on electrical charts is undesirable. The electric industry should take a hint from the coal industry and use arrows to define direction of electron travel, as coal men have long used arrows to show air travel. When the cathode is marked minus, it means only that it is minus with reference to the anode on the other side of a rectifier tank. It should be marked plus with reference to the equipment it serves and to the conductors leading therefrom and to any point on the conductor by which the electrons approach that tank. When the anode is marked plus it means only that it is plus with reference to any point in the path from the cathode, to the cathode itself and to points in the conductor leading to the cathode. It should be marked minus in reference to the conductor and equipment which the current feeds through the anode.

Only coal men can object to the change, and they will do it on the ground that they have already too many arrows on their maps —arrows for ventilation, for dips and sometimes for rises, for directions of haulage travel, for travel of water in pipes and for escapeways. Just imagine the use of plus and minus signs for ventilation! Seen without an electrical background to justify it, it seems a ludicrous notion.

It would serve well enough, in ventilation, for a section of a mine separately presented or, in a wiring diagram, for a section of an installation separately charted, but it can mislead the novice if used on a map or a wiring diagram if, though intended for a section only, it is used without a footnote expressing its restrictive reference. An arrow would never mislead except when the current is alternating.

Q.—Is a wet mine assured against electrical fires?

A.—No, a wet mine is about as likely to have an electric fire as a dry mine and equal care should be taken in all mines.

Distilled water is a non-conductor, but mine water contains acids, alkalis and/or salts that make the water a good conductor, and where a current passes, heat is generated that will dry the coal and prepare it for combustion. Everyone knows that mine water will carry a current. If the current continues to pass the coal will be carbonized, and then it will be a better conductor than ever, so that more current will pass and soon the coal will be set on fire. Anthracite is a much better conductor than bituminous coal and therefore is more subject to electrical fires and short circuits.

How Much More Dust

Q.—Suppose there is 25 to 40 percent of volatile matter in the coal after the analysis of the coal has been recomputed omitting water and ash and suppose there is 2 percent of methane in the air, and it is found that instead of the quantity of rock dust prescribed for those conditions —77 percent—there is only 67 percent present, how much rock dust must be added?

A.—The quantity of coal dust will be $100 - 67 = 33$ percent. Therefore, there will be $67 \div 33 = 2.0303$ times as much incombustible as there is coal dust. With 100 lb. of coal dust, 203.03 lb. of rock dust will be present.

The quantity of rock dust should be 77 percent and the quantity of coal dust then would be $100 - 77 = 23$ percent. Thus there should be $77 \div 23 = 3.3478$ times as much rock dust as coal dust. Suppose there is 100 lb. of coal dust there will have to be 334.78 lb. of rock dust. But there are already 203.03 lb. consequently $334.78 - 203.03 = 131.75$ lb. will have to be added for every 100 lb. of coal dust and not 10 lb. as might, at first, be thought.

As 203.03 lb. of powdered rock has been added to the coal dust in the total of all earlier dustings, and as 334.78 lb. was actually needed, the quantity should have been $\frac{334.79}{203.03} = 1.65$ times what was before provided. Hence for every pound added before $1.65 - 1.00 = 0.65$ lb. should be added by the projected rockdusting. For safety sake, say not 0.65 or about two-thirds as much, but rather just as much rock dust as in all the earlier dustings, which were severely deficient in quantity. Many a place probably goes half-safe, solely because the law of deminishing returns is unrecognized.

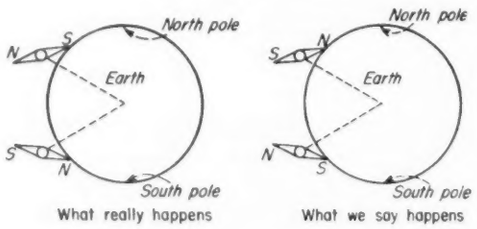

Fig. 2—Magnet's south pole seeks earth's North Pole as like seeks unlike, but we usually say that the pole that seeks the North Pole is the north pole of the magnet.

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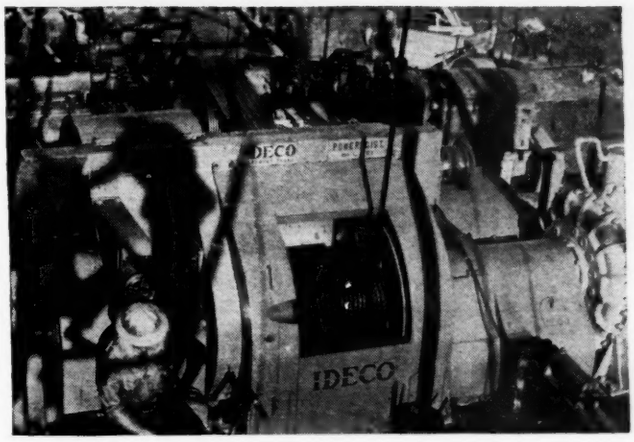

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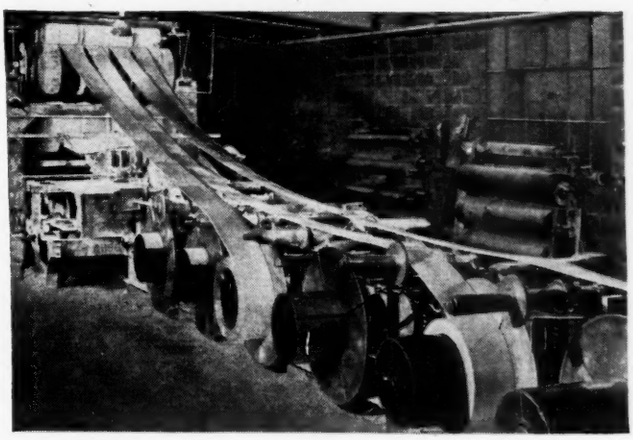

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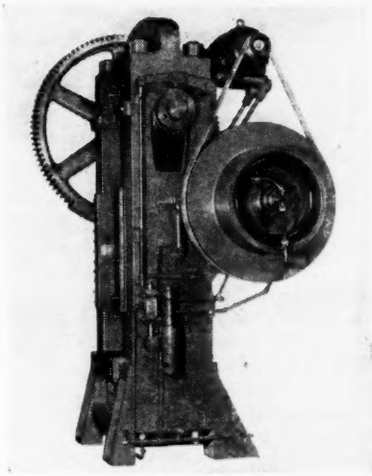

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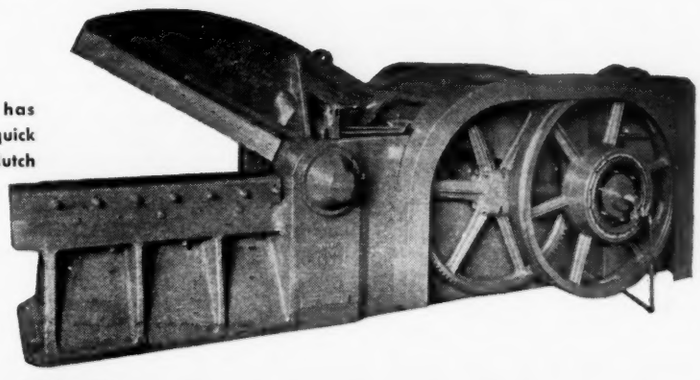

▶ Alligator shear operates through Fawick Clutch and Brake.

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Operating Ideas

Ten Jig-Box Improvements

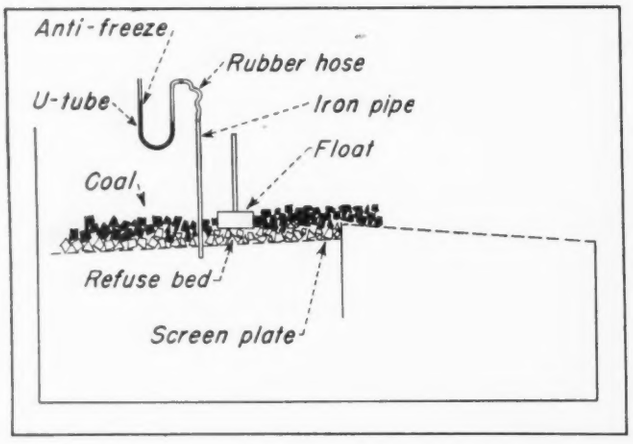

Fig. 1—Fluctuations of the liquid in a U-tube pressure gage, fastened in the screen plate, indicate the depth of refuse bed in the jig box.

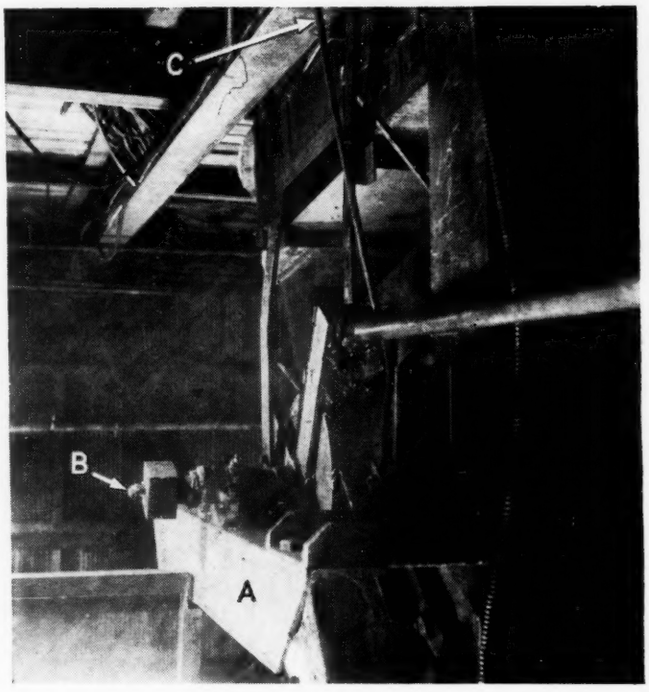

Fig. 2—Showing how ratchet operation was improved: "A" is the outboard shaft extension; "B" the square lug for turning the star ejector valve in case of clogging, and "C" the indicating rod.

JIG BOXES employed in coal washing constantly undergo changes in operation with improvements by both the manufacturers and the mining companies. Washing the coal better is an ever important objective, with progressive management always alert for improvement in preparation and increased efficiency. The Enos Coal Mining Co., Oakland City, Ind., is no exception and, among other things, has developed the ten jig-box operating ideas summarized in the following material. Coal is crushed to a top size of 8 in. and all is washed. The primary refuse goes directly to the refuse bins for disposal. Secondary refuse is crushed and recirculated. The jig is rated at 300 tons per hour but handles about 500 tons per hour.

1. *Increasing Jig-Box Capacity*—The raw-coal feed chute is extended 6 in. over the feed end of the jig box, thereby permitting raw coal to enter the box beyond the eddies and where the water is traveling. This gives the coal a flying start, thus increasing capacity of the jig.

2. *Improving Float Operation*—A 5-in. steel angle is set vertically in front of the hydrometer or float in the primary end of the jig box. It divides the coal flow and prevents heavy coal from striking the supporting stem of the float. This prevents undue friction or damage, permitting the float to function more accurately.

3. *Maintaining Bed Thickness*—A glass U-tube, containing anti-freeze, is connected with a rubber hose to an iron pipe set vertically in the jig screen. The end of the pipe extends below the screen, as shown in Fig. 1. A thick bed causes the liquid to rise in the tube and a thin bed of refuse permits the liquid to drop. The successful separation of coal and refuse, not wasting coal or holding refuse, is controlled by maintaining the correct depth of refuse bed. A good indication of the refuse-bed thickness permits the operator to regulate the jig efficiently. Although the fluctuations of the liquid in the tube are violent, the operator soon learns to judge accurately thickness of the refuse bed.

4. *Correcting Ratchet-Wheel Wabble*—The ratchet shaft of the rotating star refuse ejector valve has been extended and an outboard bearing attached to the outside of the jig box to steady the shaft. This eliminates all wabbling of the ratchet wheel, keeps it lined up and insures a uniform and free movement. A large square lug is welded to the end of the shaft, by which the star ejector valve may be turned with a long-handled wrench in case of clogging. Fig. 2 shows this improvement.

5. *Eliminating Refuse Screw Clogging*—There is a tendency for the refuse screw conveyor to become clogged by fine refuse settling in the bottom of the conveyor trough. This embedded material may be readily loosened by installing a water connection to the bottom of the trough. A turn of the valve admits water under pressure, cleaning out the fine material and permitting the screw to turn freely.

6. *Checking Refuse Discharge Adjustment*—A small round steel push rod extending from 2 ft. above the operating floor to the

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Fig. 3—"Refuse disturber" at secondary end of the jig prevents the refuse bed from clogging at the star ejector valve. A chain driven by a gearmotor goes down one side of the jig box, across the bottom at right angles to the flow of coal and up the other side. An incasing guide maintains the chain on the desired course.

ratchet of the ejector valve makes it possible to determine ratchet movement by laying a hand on top of the rod. Needed refuse-discharge adjustment may then be made as necessary.

7. *Reducing Elevator Clogging*—Clogging in the refuse elevator is caused by refuse failing to enter the bucket in the boot. The difficulty usually is the result of large pieces of refuse jamming. A ready relief is to install a hinged plate immediately under the bottom travel of the buckets. By swinging the plate up and down the material is loosened to permit free operation of the conveyor.

8. *Preventing Ejector Valve Clogging*—A "refuse disturber" has been installed at the secondary end of the jig box. The disturber is made of a conveyor chain with lugs or half flights all pointing one way—that is, all on one side of the chain center. A hollow square guide with a slot on one side holds the chain in place. This guide is made from rolled steel shapes welded together. The finger flights keep the secondary refuse bed stirred up in front of the star ejector valve and prevent clogging. The disturber (Fig. 3) is motor-driven independently of other machinery.

9. *Maintaining Refuse Bed When Coal Flow Ceases*—Stoppage of the raw-coal feed to the jig soon destroys the refuse bed and upsets normal separation of refuse from coal. A butterfly air valve on the air tank permits the immediate release of air from the system when the coal feed ceases and permits the refuse bed to remain static until coal is again available. The valve may be manipulated from several points around the jig, as illustrated in Fig. 4.

10. *Counterbalancing Oil Gage*—Blowers supplying air to jigs normally operate for years without repair except in case of accident. At Enos, the oil gage turned over, permitting the oil to drain out of the cellar. To prevent a repetition a "T" was substituted for the "L" connection that normally supports the gage. A long pipe was screwed into one end of the "T" with the gage in the other end. The pipe counterweights the gage, thereby maintaining its upright position and preventing it from being overturned. Fig. 5 gives the details of the improved installation.

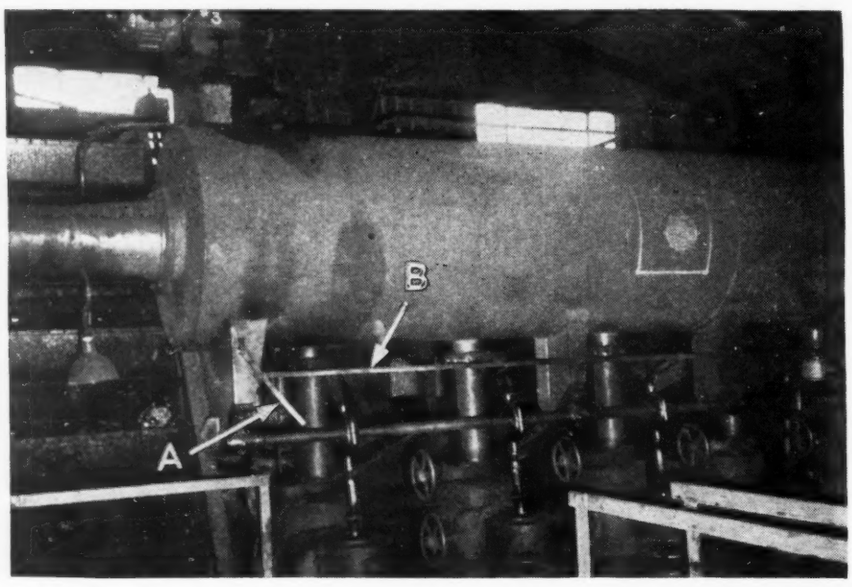


Fig. 4—When the flow of raw coal stops, the air is released from the system by handle "A" and rod "B," which controls a butterfly valve on the tank. This action assures the proper refuse bed for efficient operation when coal again flows.

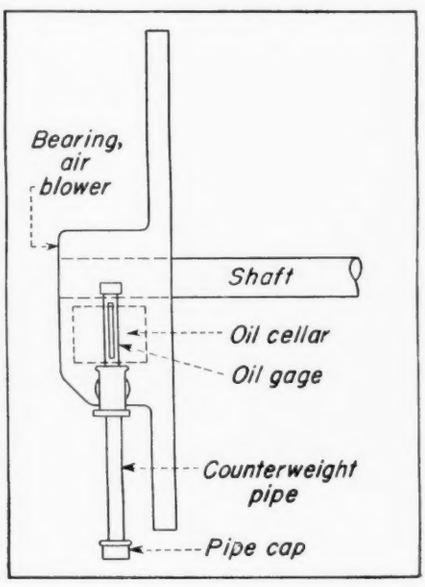


Fig. 5—Pipe screwed into the bottom of the "T" connection counterweights the oil gage, preventing its turning over.

Lugging coal—you've done it, perhaps, in a small way. In a big way, it's a back-breaking job. But not for this conveyor belt of ours, in a Pennsylvania coal mine; despite reverse bending, a right-angle feed, large and unequal pieces to be carried, and an uneven distribution of load.

All these difficulties have meant nothing to it. It has been operating for many years, and plans to be for many more. BWH quality in materials, and our exclusive Rotocure process of vulcanization, are the answer.

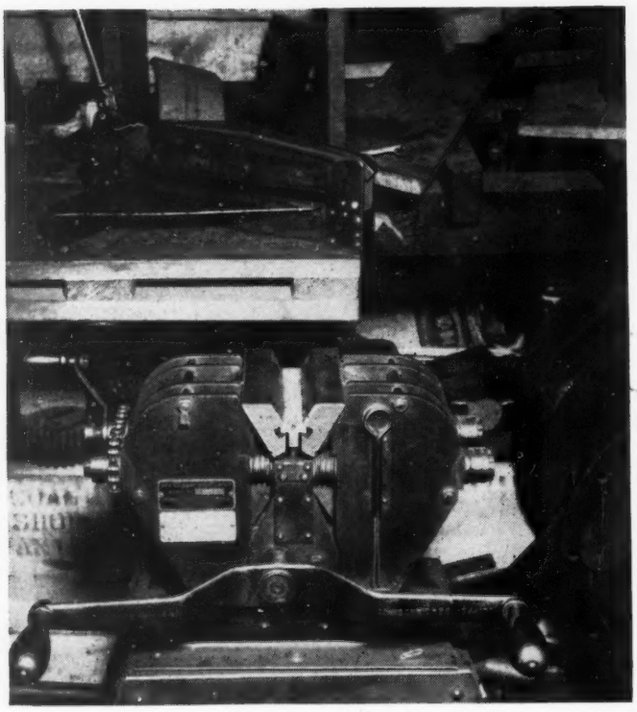
Something rough and tough to carry? Ask our nearest distributor, or write to us. You'll be convinced.

BOSTON WOVEN HOSE & RUBBER COMPANY
WORKS: CAMBRIDGE, MASS.
POSTAL ADDRESS: BOX 1071
BOSTON 3, MASS., U.S.A.

KEEP THOSE BONDS

Made by the Rotocure process of continuous vulcanization which replaces variation with uniformity.

Cutter and Lacer Facilitate Belt Work



Belts are cut and squared on the cutter and then the lacing is attached in the device below.

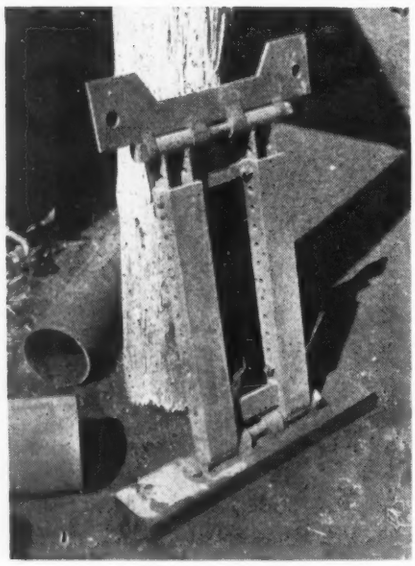
Milton Craig, shop mechanic, demonstrates the lacer.

To MAKE SQUARER and more perfect splices a cutter and lacer are used for all belt splicing, states George Kline, machine-shop foreman at the Lehigh Navigation Coal Co.'s Central Mine Repair Shop, Lansford, Pa.

The Clipper cutter and the No. 6 Clipper speed lacer, shown in the accompanying illustrations, not only speed up the making of splices but help to make splices that more nearly approach mechanical perfection.

All belt splicing is done by the same shop mechanic.

Shaker Rocker Support Improved



This new-type adjustable rocker support is used at the discharge end of the shaker line.

AN IMPROVEMENT in the design of a shaker support, states W. K. Lewis, master mechanic at the Stansbury Mine, Union Pacific Coal Co., Rock Springs, Wyo., has eliminated the troubles experienced with an older model.

The new type support, shown in the accompanying illustration, is used at the discharge end of the pan line between the drive and the carloading station. The vertical posts of the old model were constructed of pipes, one telescoped in the other. After moisture got a chance to collect between the pipes the resultant corrosion made adjusting much too difficult. The new model, built with structural shapes and with ample tolerances, however, always is easy to adjust.

Ex Trouble

Trouble educates. For example, take the wiring diagram for an automatic substation. We grow more familiar with it with each case of trouble. When trouble has us pinned down, we learn much while squirming our way out. Afterward, most of us are grateful for such experience—experience through trouble. Tell us about some experience you've had in solving mechanical, electrical, operating or safety problems. If accepted, Coal Age, upon publication, will pay you $5 or more each.

O.K.

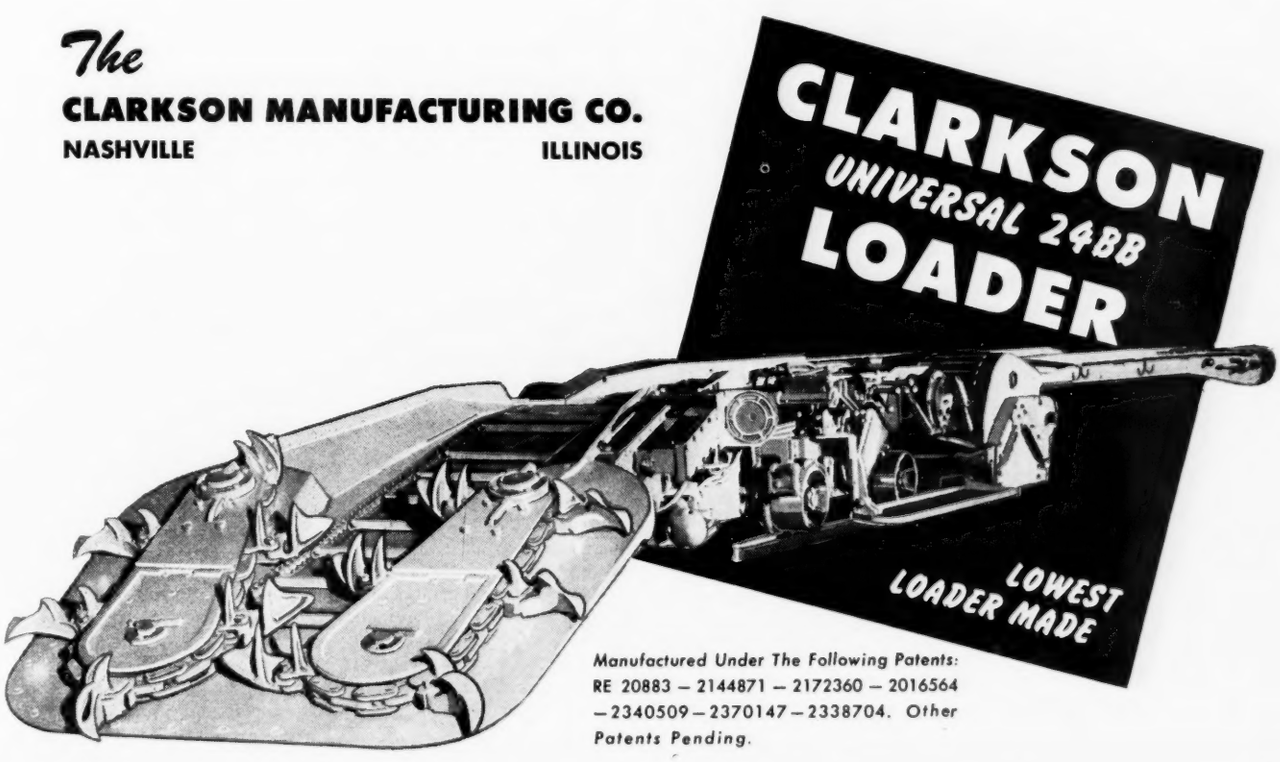
Says Uncle Sam

on the

CLARKSON *Universal* Right or Left Control

Yes, that "Stamp of approval", *plus* the advantage of right or left hand control, and the fact *that one motor does the entire power job,* should decide *your* choice when considering the most practical Loader.... We'll be glad to supply more facts if you'll ask for them!

The
CLARKSON MANUFACTURING CO.
NASHVILLE **ILLINOIS**



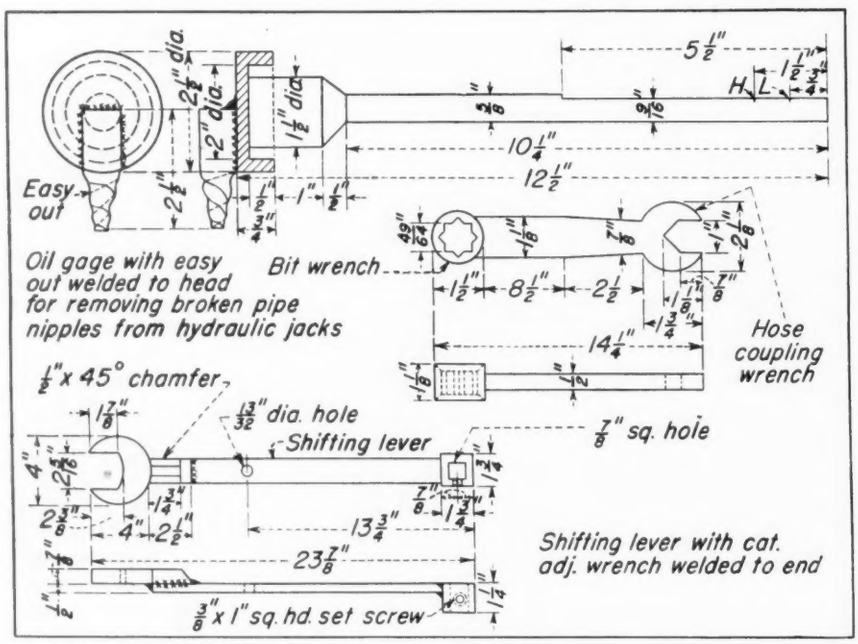
Manufactured Under The Following Patents: RE 20883 – 2144871 – 2172360 – 2016564 – 2340509 – 2370147 – 2338704. *Other Patents Pending.*

Dust Allayed With Oil and Water Mixture

A MIXTURE OF OIL AND WATER is reported to be giving gratifying results in allaying dust from cutting machines at the Montana Coal & Iron Co., Billings, Mont. As a result of experiments with various ratios of oil and water over the past 18 months the most favorable results seem to be obtained by a mixture of two parts Superla soluble oil (Standard Oil Co.) with 100 parts of water by volume. Not only is dust settled more effectively but less volume is required than with water alone. As the mine is dry, this represents quite a saving in haulage and storage. Cutters are Sullivan 7-AU and the mixture is supplied from 100-gal. metal tanks mounted on the frames of the machines.

There is sufficient pyrites to form a dilute solution of sulphuric acid when the cuttings are mixed with water. This acid acts upon the chains and results in their excessive wear. Use of the mixture has retarded action of the acid, thereby prolonging life of the cutter chains and bits. Additional tests are under way to determine the possibility of lubricating cutter chains entirely by use of the mixture.

Keeping Wrenches and Tools on Loaders Solved


Easy-out
Oil gage with easy out welded to head for removing broken pipe nipples from hydraulic jacks
Bit wrench
Hose coupling wrench
Shifting lever
Shifting lever with cat. adj. wrench welded to end
sq. hole
dia. hole
chamfer
set screw

Top—Easy-out welded to oil gage. Left—Caterpillar adjusting wrench on high and low shift lever. Right—Hydraulic hose and bit wrench as one unit.

HOW TO KEEP TOOLS with a loading machine is a problem in many mines. It is not difficult to keep a tool that is needed regularly, like a bit wrench, but it is different with tools needed only once a week or once in several weeks. A good approach is indicated by the combination tools and the one type of attached tool shown in the accompanying drawing. They represent new practices at Banning No. 1 mine of the Pittsburgh Coal Co., where John Narbut is master mechanic. These tools are for Joy BU machines.

The top drawing shows an easy-out welded to the head of the oil gage that is used at the rear of the machine. With this easy-out the machine operator can remove a broken pipe nipple for a hose connection and then install a new hose without calling the maintenance man away from his regular overhauling job. To replace the hydraulic hose requires a suitable wrench, however, so that article is made in combination with the bit wrench, as shown in the drawing.

The problem of keeping a wrench at the machine for taking up the tracks of caterpillars is solved by welding this wrench to the end of the high and low shifting lever. As the operator must replace the lever to operate the machine he cannot be without it.

Auxiliary Gate Not Necessary

UP TO DATE Hydro-Separator washing units do not need auxiliary or chop gates to prevent loss of coal to refuse, writes F. E. Mueller, president, Roberts & Schaefer Co., in reference to the Operating Idea appearing on p. 128 of the October, 1945, *Coal Age*, under the title of "Gate in Hydro-Separator Saves Coal from Refuse."

"Feeling," states Mr. Mueller, "that this gate is not necessary in our up-to-date Hydros and since we feel that the articles might be misinterpreted by prospective clients in that it might imply inefficiency of the machine, we referred your article to one of the users of our Hydro who has several in operation. It is a large coal company and we quote the reply:

" 'In reply to your letter relative to the article in *Coal Age* covering the use of an auxiliary gate for saving coal in the refuse, the use of a quick-acting gate in a Hydro cell is rather old stuff because we have been using the principle on one of our units ever since the plant was placed in operation. However, we make use of the present slate gate for this purpose, which eliminates the installation of an auxiliary gate.

" 'For your information, where a washer is operated spasmodically, some coal can be saved by dropping the slate gate down to the grid plate whenever the unit is shut down. However, where the units are operated more or less continuously, this is not necessary.

" 'What happens in the cell under spasmodic operation is as follows: The recirculating pump is stopped, the water in the cell returns to the pump sump, or clarifying tank, and consequently the bed of materials which has been formed settles down tight against the grid plate and refuse gate. When the pump is started, the instantaneous pressure to the cell is so great that the bed is completely destroyed in the cell and coal, as well as impurities, is discharged momentarily into the reject elevator.

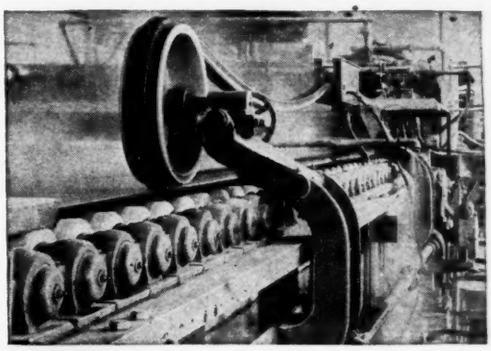
" 'I would say that if the Hydro is to be operated spasmodically throughout the shift the slate gate should be designed so that it can be readily and quickly dropped, as a small saving can be realized in coal losses. However, it is not necessary to add an auxiliary gate, or so-called chop gate; neither is the quick-acting gate necessary if the recirculating pump is kept in operation.' "

On wet, hot or dusty jobs... get better lubrication with

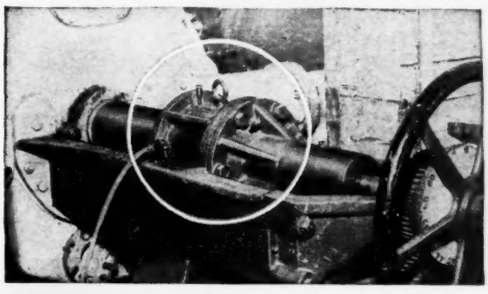
SUPERLA GREASES

Superla Greases are available in two types and a wide range of grades. You will therefore find them the answer to better lubrication of anti-friction bearings under many operating conditions.

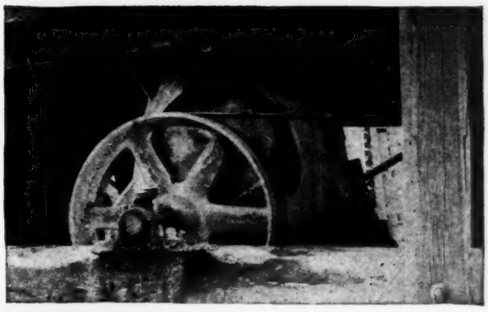
Just a few examples are briefly described here. The booklet gives more details of the properties and qualities of Superla Greases. It may help you save maintenance and money by showing you how to reduce bearing failures. Write Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago (80), Illinois, for a free copy of the booklet.



WET Wet-end roll bearings on paper mills are particularly difficult to lubricate because they are subjected to a constant shower of water. They require a high grade moisture-resistant lubricant such as Superla Numbered Greases, which are lubricating many installations of this type.



HOT In Jordan bearings, pressures are high and excessive temperatures frequently occur. The high grade Stern Stafford anti-friction bearings pictured above have been successfully lubricated for a number of years with high temperature Superla X Grease.

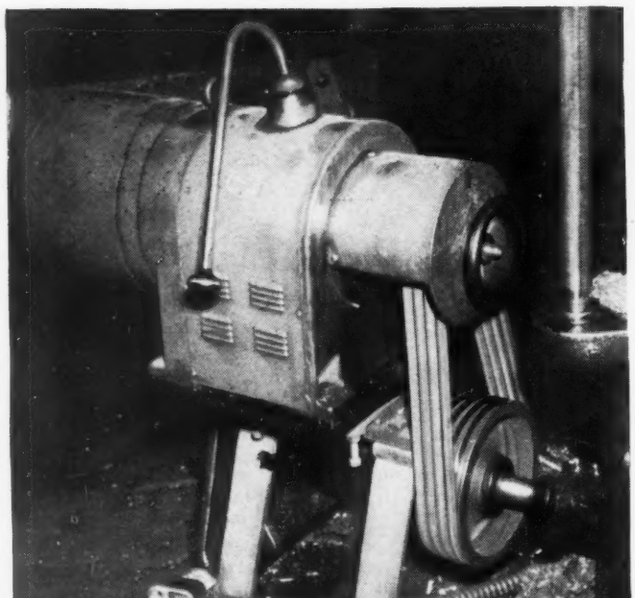


DUSTY Because all bearings can't be operated in air-conditioned surroundings, some, like the crusher bearings pictured above, need the all-weather protection of Superla Grease. Before Superla was used, these bearings twice needed replacing because of summer overheating, which allowed the grease to leak out and dust to get in. With Superla Grease, no bearings have failed, summer or winter.

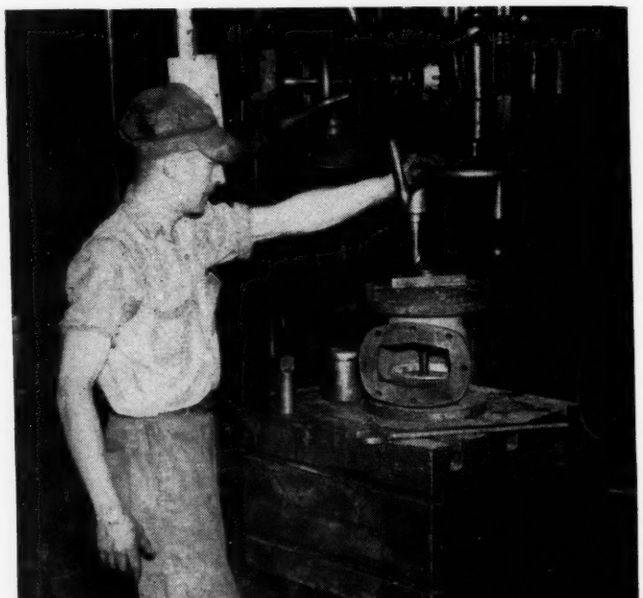
Buy and hold more Victory Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

Gear-Shift Drive Modernizes Radial Drill



The radial drill, formerly driven off a lineshaft, now has its own drive.



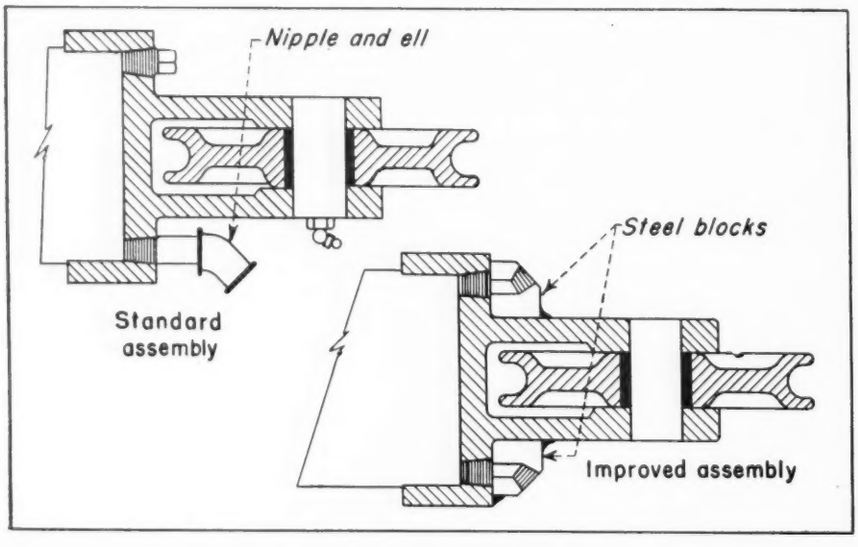
Walter Bechtel, machinist, is using a template to drill a valve housing. The gearshift drive is in the background.

GEAR-SHIFT DRIVES are being used to change shop machines from noisy lineshaft operation to that of individually controlled electric drives, reports George Kline, machine-shop foreman at the Lehigh Navigation Coal Co.'s Central Repair Shop, Lansford, Pa.

The Lima 5-hp. gearshift drive, shown driving a Manning, Maxwell & Moore radial drill in the accompanying illustrations, has four speeds. The drill has three speeds incorporated in its immediate drive, and with the gearshift twelve speeds are available.

This is the third unit that has been installed in the shop. Two others have been installed on lathes. Thus the shop's last remaining lineshaft drive is fast disappearing and eventually all the shop machines will be equipped with individual drives.

Block in Place of Nipple Improves Swing Jack



Hydraulic hose connections: original at the left; improved at the right.

ANOTHER EXAMPLE of how maintenance of coal-mine machinery has outgrown the "fix it over and over again" stage is illustrated by the accompanying drawing of a simple but effective change made on the hydraulic system of 7BU loading machines at mines of the Pittsburgh Coal Co.

Delays and losses of oil were frequent because of breakage of the $\frac{3}{8}$-in. nipples of the hose connections to the swing jacks. Standard nipples were too delicate for the exposed position. To take the place of both the nipple and a 45-deg. elbow a fillet block $1\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{2}$ in., with a hole and a threaded connection, was welded into the corner.

The suggestion for this improvement came from mechanics at Banning No. 1 mine.

MECHANIZED MINE TONNAGE SOARS

While Hand-Method Mines Remain Close to 1934 Level!

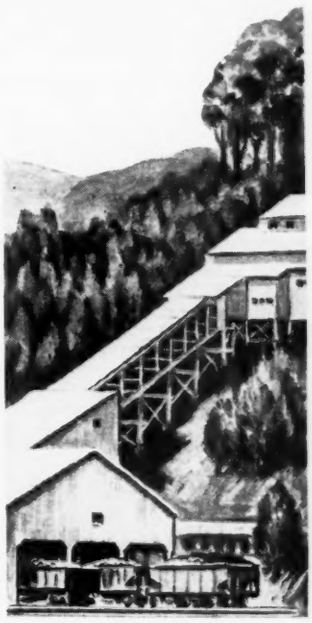
★SINCE 1934, tonnage from deep mines using mechanical loading has increased from 10 to 125 Million Tons—mechanically loaded output from stripping has risen from 7 to 30 Million Tons—while tonnage from mines using hand loading methods today is *only slightly in excess of 1934 production.*

Only Present Abnormal Demand Keeps Primitive Methods Temporarily Profitable While *Clean* Coals from Mines Mechanized Below and ABOVE Ground Capture the Better Markets

The writing is on the wall. *Modern mechanized preparation equipment* raises product value by producing clean coals that win the better markets and higher prices. It cuts labor and waste—and increases production!

Morrow Tipples are found in a high percentage of all the modern mechanized mines, because Morrow *streamlines* production from mine to cars or barges, in shorter time, at lower cost—in the best condition to SELL!

Ask Morrow to assign an engineer to study your situation. Write The Morrow Manufacturing Company, 1940 Ford Blvd., Wellston, Ohio. *Division The Wacker Corporation.*



Better Preparation
= INCREASED SALES!

1. low impurity content
2. correct sizing
3. high uniformity

MECHANIZE WITH MORROW

COAL WASHERS • WEIGH PANS • FEEDERS • DUMPS
BINS AND BIN GATES • FLANGED LIP SCREENS
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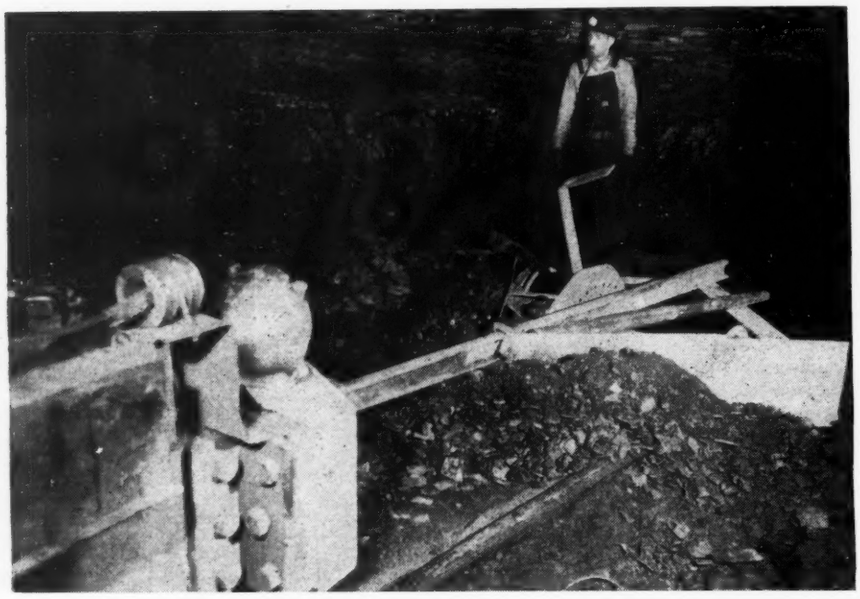
PERFORATED METAL SCREENS • STEEL STRUCTURES

Track Cleaner Also Plows Snow



This plow cleans track at a rate of 100 ft. or more per minute.

UNDERGROUND tracks are freed of accumulations of coal and rock at the rate of 100 ft. per minute or more by a plow-type cleaner at the Hilo mine of the High Splint Coal Co., High Splint, Ky. The plow, after adjustment, also is used to remove snow from the outside tramway.

A first model of this cleaner, designed by Elijah Tackett, section foreman, is shown in action in the illustration. Mr. Tackett stands in the background. Track gage is 44 in. The plowshares are notched on the bottom edges to fit down over the rails. They extend 14½ in. outside. The axle on which the two track wheels are mounted has an upward throw to the straight or central section, which is clamped loosely in axle boxes. This axle can be rotated about 90 deg. by a lever, which can be locked in place to set the plow down to just skin over the ties.

For plowing snow the track cleaner must of necessity be pushed ahead of the locomotive rather than pulled. This is done by slipping the tongue, which is a piece of rail, out of the plow and inserting it from the back end. From the headhouse, which is high on the mountainside, the outside haulage consists of 800 ft. to one drift opening and 1,800 ft. in the other direction to a second drift opening. The plow has cleared several deep snows in a few minutes with practically no delay to the mine.

Main haulageways underground are cleaned with one pass of the plow as needed, or about once a week. In one instance the cleaner was timed over a 700-ft. section of the track and required 5 minutes. On the first model, shown in the illustration, the mold boards lack 2 or 3 in. of the height necessary to prevent some of the material spilling over when deep accumulations are encountered.

Mr. Tackett has patented a track cleaner of the general type described (Serial No. 523,880, April 24, 1945, Patent No. 2,374,312). It includes an adjustable clevis to change the tongue height to suit various locomotives and track conditions.

Storage Rack Protects Drills

Frank Weston, tool-room clerk, checks the drill size before he hands it to a machinist. John Pry, tool grinder, sharpens all drills, lathe turning tools, etc.

DRAWERS FOR the smaller drills and separate pigeonholes for the larger sizes are essential in a shop the size of the Lehigh Navigation Coal Co.'s Central Repair Shop, says Frank Weston, toolroom clerk.

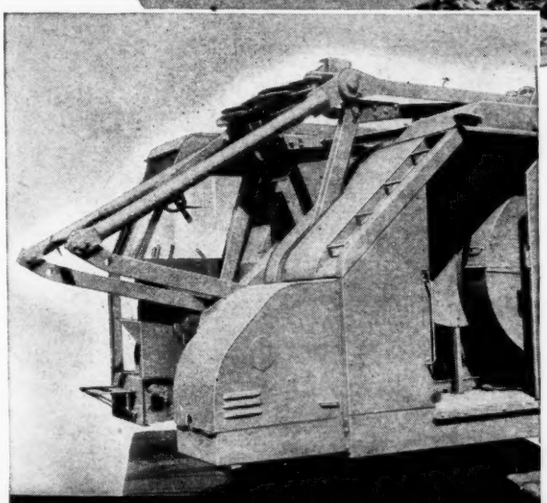
The illustration shows how sharpened drills, usually several of each size, are kept clean and protected from injury by proper storage from the time they are sharpened until they are needed in the shop. Drills ranging from $\frac{3}{32}$ in. up to $1\frac{1}{8}$ in. are kept in the drawers while the pigeonholes accommodate drills up to $3\frac{3}{64}$ in. in diameter.

With each drill compartment clearly labeled, and every drill in its place, no time is lost in handing out the proper size drill to the machinists in the shop. Likewise, the tool grinder can quickly check the rack to see if there are enough sharpened drills available for the needs of the shop.

KOEHRING

605

POWER RAISES LOWERS HIGH A-FRAME FAST...



High A-Frame folds up like this after two pins are removed.

Because **power raises and lowers the High A-Frame fast, you cut moving expenses every time you ship the new Koehring 30-ton crane by rail, every time you truck it through a highway underpass, every time you move it under overhead obstructions on the job. In just a few minutes you reduce overhead clearance from 18'-8" to 12'-9".**

REMOVE 2 PINS, THAT'S ALL

Raising or lowering the 605 High A-Frame is simple, safe. Remove 2 pins and the High A-Frame is ready for lowering by power. A cable attached to the hoist-drum controls lowering speed. The same cable raises the 605 High A-Frame back into position. No danger of over-pulling because the High A-Frame comes to a definite stop when fully raised.

SUSPENSION CABLES STAY ON

Boom suspension cables stay in place on short moves. Because the frame is strong, the Koehring 605 crane may be operated with the High A-Frame in any lowered position.

ASK FOR YOUR 605 CATALOG TODAY!

KOEHRING COMPANY
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KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

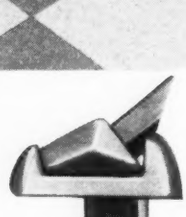
MAKE YOUR NEXT MOVE TO...

CINCINNATI DUPLEX CHAIN

CINCINNATI CHAINS AND BITS

CHECK rising production costs and maintenance repairs with long life, trouble free Cincinnati Chains, Bits and Cutter Bars. Cincinnati Chains and Bits OUTLAST AND OUT CUT them all. Heat treated and perfectly designed and engineered, Cincinnati coal cutting equipment increases production and decreases costs. Keep production flowing smoothly . . . use Cincinnati TIME TESTED Chains, Bits and Cutter Bars.

Cincinnati Standard Chain accommodates Stanex Holder and Bit or regular ½" x 1" Bit. Similar in design to the famous Duplex Chain.



The Stanex Holder and factory made double ended Stanex Bit, fits all chains accommodating ½" x 1" Bits.

Easily removed heat treated Rivet holds Bearing Pin against longitudinal displacement.

Hardened Eccentric Pin is designed so it can't turn in block... puts joint wear between pin and insert.

Long life, replaceable, hardened alloy steel Connector Insert gives new factory joint accuracy to a worn connector

THE CINCINNATI MINE MACHINERY CO.

2983 SPRING GROVE AVENUE • CINCINNATI, OHIO

News Round-Up

Nationalization Bill Sent to Parliament

London, Dec. 22 (by Cable to *Coal Age*)—In accordance with previous announcements, the Labor Government has introduced into Parliament its bill for nationalizing the British coal industry. The chief proposals of the measure are:

1. Establishment of a National Coal Board of nine members to acquire collieries, manage industry, secure sufficient development and make supplies of coal available in quantities and at prices to serve the public interest. Members must be experienced in business, applied science, administration or organization of workers. Board members would be paid on commercial, not civil-service, scale. Two probably will be from present management and one from the union.

2. The board is to have full and free responsibility for management of the industry, including initial organization and day-to-day operations, but will be subject to general governmental policy through the Ministry of Fuel and Power.

3. The board is to be granted £150,000,000 for use in the first five years and has the right to borrow an additional £10,000,000. The board is to be liable for payments to the Minister of Fuel and Power to repay Crown expenses and liabilities incurred in acquiring industry assets and providing capital. It also will be liable for taxes and for interest and establishment of sinking fund for sums provided by the treasury.

4. Two consumer councils—industrial and domestic—are to be set up to advise the Minister of Fuel and Power on supplies and prices. These are the only subsidiary bodies specified, and the National Board is to be free to set up regional and district organizations and machinery for the required consultation with the union.

5. Total compensation to property owners will be determined by an arbitration tribunal of three in accordance with an agreement between the government and the Mining Association. Apportionment of the industry figure agreed upon among the individual colliery companies will be handled by a central valuation board. The tribunal will ascertain net annual revenue that total assets might reasonably be expected to earn in the future if not transferred to public ownership and also will determine the number of years over which payments shall be spread. The procedure is roughly the same as that followed in 1938 when the Conservative Government took over the coal reserves of the country.

6. Compensation for nationalized properties will be largely in government stock unmarketable except with Treasury approval. This is intended to prevent flood of money entering the money markets but is regarded in business circles as tyrannous refusal by government to pay its debts in negotiable instruments.

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Home-Oil Scarcity Said to Impend

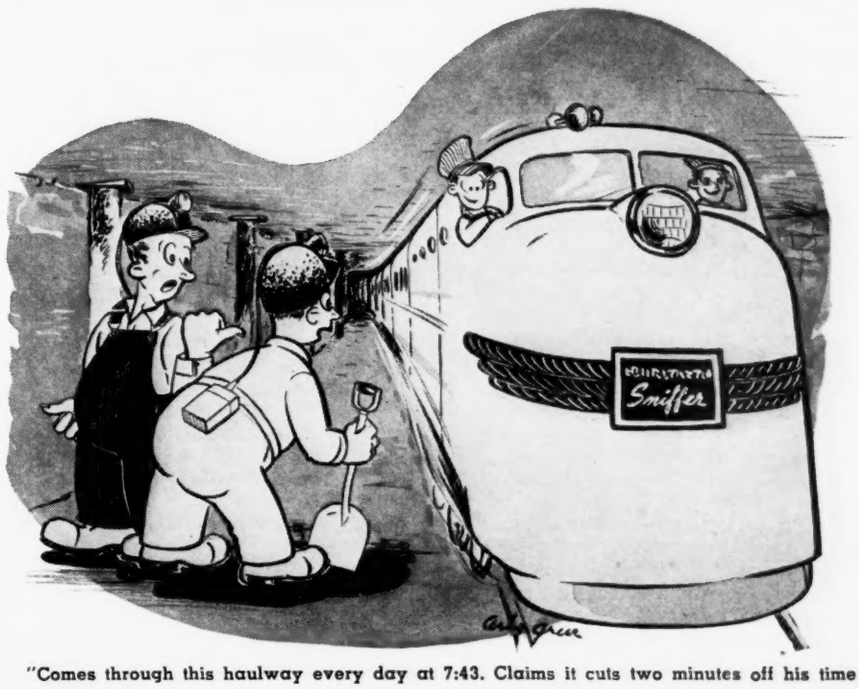
Many homes may be uncomfortably cold this winter, it was predicted Dec. 16, because of a fuel-oil shortage attributed largely to the huge production of gasoline since rationing ended in August. Warning of an extreme shortage in kerosene and fuel oil on the entire East Coast, Mayor La Guardia of New York said the petroleum industry was finding it more profitable to make crude oil into gasoline than into home-heating oils. He urged that the Office of Price Administration reduce the ceiling price on gasoline and permit an increase in heating-oil prices to force the refineries to shift the production emphasis from motor to fuel oils.

Asserting that rationing of gasoline and fuel oils had been lifted "perhaps a little too soon," the Mayor said that the only control left is the economic control. The low level of fuel-oil stocks, he added, was aggravated by the loss in September of three weeks' production because of a strike.

OPA officials in Washington said action probably would be taken soon on a recommendation made by an industry advisory committee for a price increase to stimulate production of heating oils and their transportation to the East. Admitting that the situation was serious, they insisted, nevertheless, that the shortage was "not yet acute."

OPA, according to a spokesman, had not committed itself to the necessity of increasing prices, and it was said that even if a price increase were to be granted to refiners of heating oils it would not necessarily be passed on to householders. Oil distributors may be directed to absorb the price increase, if one is granted.

An industry advisory committee, headed by A. J. McIntosh, Socony-Vacuum Oil Co., was named Dec. 1, after the specter of a fuel-oil shortage began to take shape. The



"Comes through this haulway every day at 7:43. Claims it cuts two minutes off his time into Chicago."

group has made several suggestions to OPA lately for improving the supply and distribution of petroleum fuels, the principal suggestion having been for a fuel-oil price increase.

One of the largest refiners and distributors in the East, according to a company spokesman, was still manufacturing kerosene and home-heating oils to full capacity, but he said that the fuel-oil output of the industry in general was falling off because of the price situation. "An increase in fuel-oil prices undoubtedly would promote a larger output of fuel oil by the industry," he added. "It may be too late, however, to correct completely the situation for this winter."

Despite the heavy increase in automobile use, gasoline stocks throughout the nation are mounting steadily, a result of the emphasis placed by the companies on gasoline to the detriment of fuel-oil stocks. Gasoline stocks increased 1,408,000 bbl. in the week of Dec. 9-15 to 87,004,000 bbl., compared with 81,136,000 bbl. a year earlier. In the same week stocks of light fuel oil dropped 1,868,000 bbl. to 42,406,000, against 43,886,000 a year earlier. Heavy-fuel-oil stocks were reduced by 1,791,000 bbl. to 44,743,000, as against 60,486,000 bbl. a year previous.

Ventilation, Safety and Preparation Kentucky Institute Themes

ALTIMETER ventilation surveys, shaft sinking around large boreholes, new graphs for washability investigations, vocational education in coal mining, basic considerations in safety and a report on fires and explosions in Kentucky mines in 1945 were subjects at the annual meeting of the Kentucky Mining Institute at Lexington Dec. 7 and 8. Registration for the meeting and banquet was 146.

George M. Humble, chief engineer, Stearns Coal & Lumber Co., Stearns, Ky., was elected president. O. W. Evans, general superintendent of mines, Norfolk & Western Ry. Fuel Department, Williamson, W. Va., was toastmaster at the banquet, at which Eldon S. Dummit, Attorney General of Kentucky, was the principal speaker. C. Prewitt Gum, general manager, Wisconsin Coal Co., retiring president, guided the meeting and called on Mr. Humble and V. D. Picklesimer, general superintendent, South-East Coal Co., to act as session chairmen.

L. F. Kerns, safety department, Koppers Coal Division, Everettville, W. Va., read a paper on the use of the altimeter in ventilation surveys by Stephen Krickovic, chief engineer of the division. "I wish to emphasize," said Mr. Krickovic, "that altimeter surveys, or technical analyses of mine ventilation, are as significant an adjunct of safe and economical mining as any other phase. Misuse or inefficient use of the comparatively tremendous investment in a ventilation set-up for a mine is unbelievably expensive. The problem is mounting in importance with the rapid strides toward mechanization of the mines. Concentration of methane liberation both in fast-moving development and retreat will more than ever require a system that is perfectly balanced between safety, flexibility and cost."

Mr. Krickovic advocated the use of two altimeters simultaneously underground, with one, of course, on the surface to check barometric changes. After explaining in detail the use of the instruments and the corrections necessary he recounted from experience eight rules to follow in obtaining reasonably accurate results. These, in brief, are:

(1) Calibrate both altimeters to obtain equal differences on identical stations at the same time; (2) hold instruments as nearly level as possible or relatively in same positions at each station; (3) set the mine and outside altimeters at the same elevation mark before the shift is started; (4) take inside readings every 10 minutes or less and not over 15 minutes apart; (5) take readings when normal flow of air at the stations is not disturbed by standing or moving trips; (6) observe pointer of altimeter for about two minutes after the instrument is balanced at each station; (7) make as many check readings in main intakes and returns as can be arranged during travels in and out of the mine; also take direct readings on intake and return sides at man doors in permanent stoppings; (8) exercise care in applying proper velocity head corrections where air velocities exceed 500 f.p.m.

L. F. Kerns, pinch hitting for Stephen Krickovic (both of Koppers), reads the latter's paper on altimeter ventilation surveys.

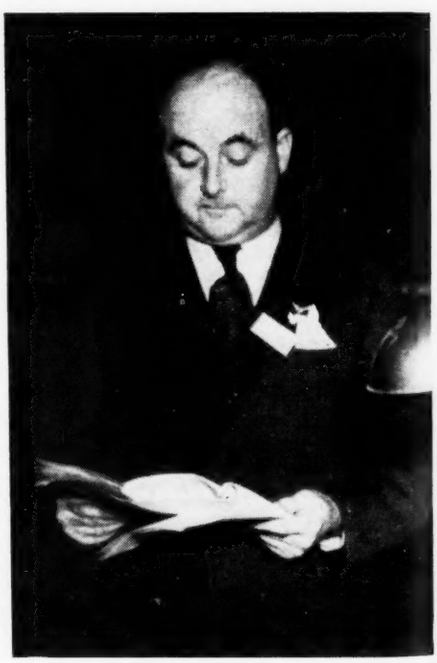
Forms for recording atmosphere variations with the outside altimeter and for air-pressure observations and corrections were shown by Mr. Krickovic. Working out these forms was an important step in developing the survey routine.

Three instances of improvements stimulated by making altimeter surveys were offered. At a 3,500-tons-per-shift mine, air volume was increased 50 percent by investing $4,000 in airway changes with no change in horsepower. At a second mine, airway improvements costing $3,500 netted a $300-per-month saving in power. At a third operation, sinking a new air shaft and other changes increased effective air 40 percent and reduced yearly power cost $8,000.

Answering a question as to the education or training required to fit a man to handle the instruments and record the data for an altimeter survey, Mr. Kerns expressed the opinion that a man who had completed high school can be trained for the job in a few days.

Aubin Higgins, resident engineer, West Kentucky Coal Co., described shaft sinking around 12-in. boreholes at the company's East Diamond mine. Two 196-ft. shafts were sunk 37 ft. apart to an airway in the No. 11 seam. One shaft, 6 ft. in diameter and lined with concrete, contains an escapeway stairs and the other, 10 ft. in diameter and lined with Armco No. 18 gage corrugated steel, is an air intake. Fear of ice was the reason for a separate escapeway shaft instead of stairs in the airshaft.

Rock was dropped through the borehole, loaded with a Joy machine into shuttle cars, transported to the outside on belts and used for road building. The boreholes were made with a churn drill. During sinking a 1-in. cable controlled by a small hoist and carrying a 15-ft. length of 75-lb. rail was kept in the hole. When a round of holes was being shot the rail was lowered so that its top was 2 ft. below the bottom of the shaft; in other words, 2 ft. below the top of the drillhole. After the shot the rail was raised 10 ft., leaving 5 ft. inside the drill-



Aubin Higgins describes shaft sinking around large-diameter boreholes.

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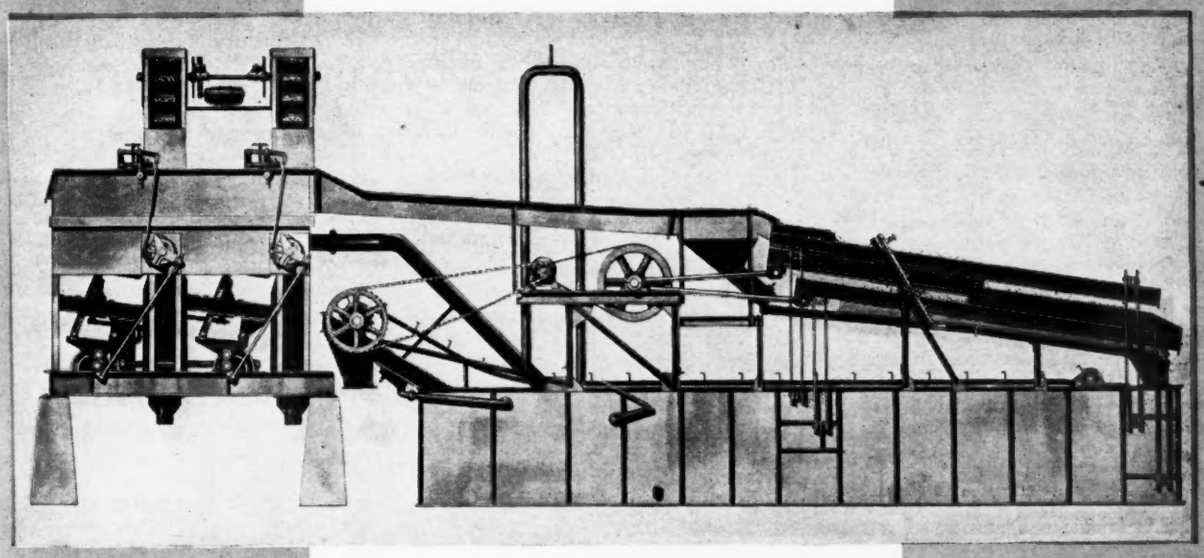
WASHERY



(Patented)

The newest Jeffrey combination unit. Washes and dewaters coal — 75 to 200 T. P. H. Consists of a two-compartment diaphragm jig, self-contained dewatering and sizing screen, steel clarification tank with recovery conveyor and water circulating system.

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George E. Keller (center) answering additional washability questions after adjournment of the regular session.

hole. A lot of small rock loosened by the shot was disposed of by manipulating the rope and shaking the rail by hand.

To protect men from falling shale in the 10-ft. shaft a lining or baffle of brattice cloth was kept between the bottom of the steel lining and the shaft bottom. Protection in the man shaft consisted of a ¼-in. steel plate 6 ft. in diameter above the bucket and of keeping the bucket close above the men while they worked. No men were allowed to remain in the bottom of the shaft when a bucket was raised but instead had to ride the bucket.

Answering questions, Ray Cobb, general superintendent, said the hole clogged three times in sinking the larger shaft but no clogging was encountered in the smaller shaft. He also stated that it is planned to pass 100,000 c.f.m. of air down the larger shaft.

"Testing the Washability Characteristic of a Coal," a paper by G. E. Keller and W. W. Anderson, both with the Commercial Testing & Engineering Co., Charleston, read by Mr. Keller, stated that "It should be emphasized that the variation in performance from size to size of a coal treated is a function of the influences of the washability characteristics of the coal and the design of the cleaning plant equipment; and because of this relationship, any sound judgment of the performance of a plant must be based on a knowledge of the washability characteristics of the feed coal to the plant."

The trend toward increased production from higher-ash seams, more partings, higher sulphur and lower fusion temperature of ash is bringing a steady increase in the percentage of production mechanically cleaned. The increase has been accelerated by mechanical mining, tighter size and chemical-analysis specifications of certain consumers, the quality basis competition to be met in the post-war period and competition from other mines already cleaning mechanically.

A properly planned and executed float-and-sink test should indicate: (1) the expected analysis of an efficiently cleaned product; (2) yield of product and quantity of refuse; (3) the ease or difficulty of the cleaning problem; (4) the range of sizes that must be cleaned to meet specifications; (5) the type and quantities of impurities in any tested size and whether certain middling gravity material should be crushed and (6) type of cleaning process best for the job.

Sampling, screen analysis, float-and-sink tests, chemical analyses and calculations were discussed in detail, then a set of five washability curves arranged on one sheet was presented covering the tests and studies of a specific coal.

Although including the three branches, (1) high school training program, (2) the area trade school and (3) the college training program, James L. Patton, director, Mayo Vocational School, Paintsville, Ky., in his paper titled "Vocational Education in Coal Mining," discussed principally the area trade school.

A new program in the process of organization at the Mayo school consists of two phases. The first includes welding, machine shop, electricity, mine repair work and also the related mathematics, science and drawing pertaining to mine work. The second, termed "training in mine installation," involves opening and operating an actual mine where the following units of study can be completed: opening a mine, drainage, mine gases, explosives and blasting, ventilation, practical mine electricity, mine fires and explosions, apparatus and instruments, first aid and mine rescue, general mine practices, operation of mining machinery, mine rescue procedure for officials and executives and foremanship.

Those units of training will be organized so men now employed in the mines can take two-to-four-weeks short courses each year or from time to time, thus over a period of years completing all units and getting a separate certificate for each and earning a diploma. Young men not employed will have the privilege of completing all units before seeking employment.

Answering questions, Mr. Patton said the complete course would require 12 to 18 months, assuming the man enters with a high school education. He emphasized, however, that graduation from high school should not be an entrance requirement. Completing the course would not make a mining engineer. That is something over and above and is the function of the university. Thomas D. Long, of western Kentucky, reported that the trade school in that district has not yet taken up the special problems of coal mining but such plans are under way and first consideration is being given to organizing classes for training foremen.

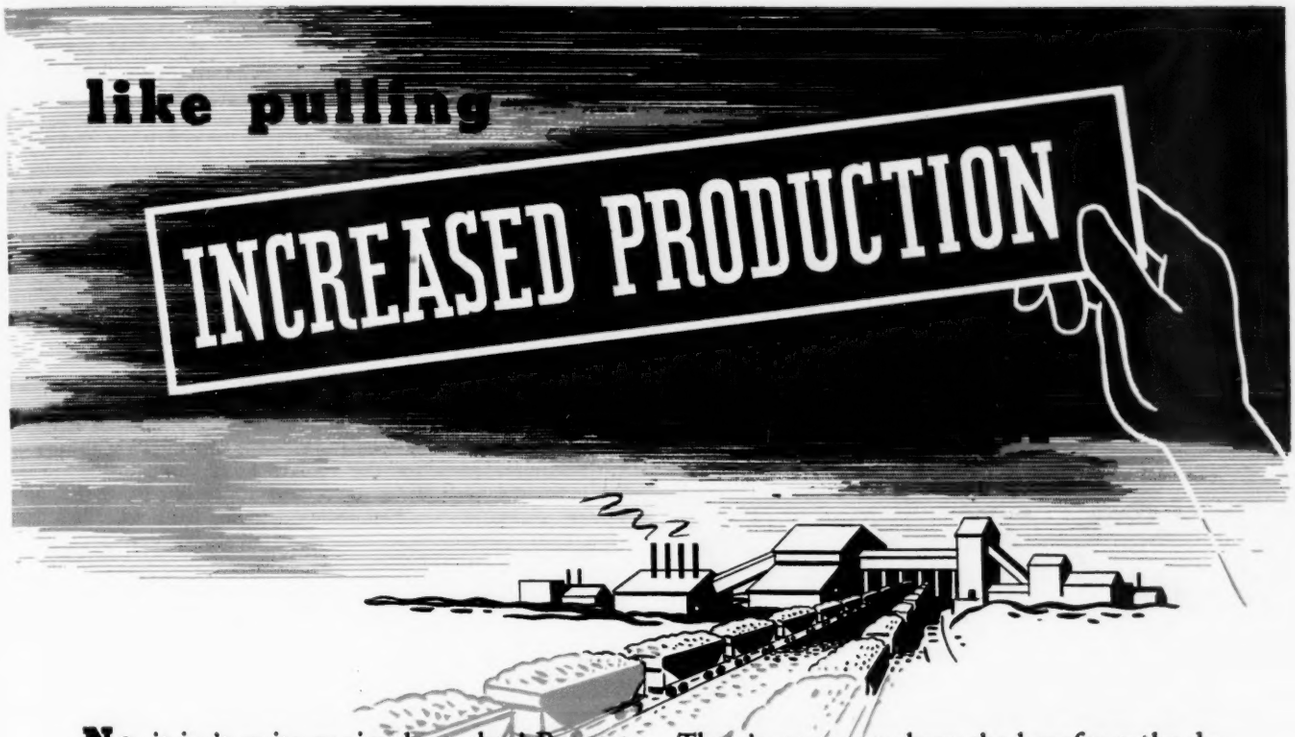
In an address entitled "Coal Mining Has the Worst Accident Record Among the Basic Industries of the United States," John E. Jones, safety engineer, Old Ben Coal Corp., West Frankfort, Ill., asked 30 questions bearing on the answer and in his discussion concentrated on the answer to "Do we stop training too soon?" To develop the answer, a positive "Yes," he compared coal's generally weak methods with those of other industries and then remarked: "I often wonder if we have really begun."

In coal mines of the United States, going back in steps from 1942, the percentage of underground deaths charged to falls of rock and coal have been 51.51 for 5 years, 53.34 for 37 years and 43.4 for 57 years. After giving those data he asked the question, "Is there anything in your experience or knowledge, in the coal mines or out of the mines, at the present time or historically, that compares with the indifference that we show toward this single cause of failure?"

Rock- and coal-fall instruction has not been taken seriously enough, Mr. Jones con-

Cornered at the end of the last session. Left to right, standing: L. P. Johnson, director; Paul M. Jones, director; Moss Patterson, former chief, Department of Mines and Minerals; C. Prewitt Gum, director and retiring president, and A. D. Sisk, secretary-treasurer. Seated: V. D. Picklesimer, first vice president; George M. Humble, newly elected president; A. W. Evans, third vice president, and Harry Thomas, new chief of the Department of Mines and Minerals.

like pulling INCREASED PRODUCTION



No, it isn't quite as simple as that! But you *can* "use air" to increase production in your mine . . . pure, fresh air, efficiently circulated throughout your mine by La-Del Axial Flow Fans. Effective ventilation creates better working conditions by eliminating noxious fumes and smoke, especially in confined quarters where foul air is most prevalent.

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La-Del Troller 8 foot diameter, high pressure mine ventilation fan, attached to shaft.

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John E. Jones addressing the institute on coal's accident record.

tended. Roof is not sounded often enough and too often sounding is a matter of habit rather than an attempt to really find the answer. Wrong conclusions from roof sounds are common because ability and experience for correct analysis are developed only with long study and experience or by teacher training coupled with experience. Mr. Jones hoped that as a result of present efforts a roof-sounding instrument will be developed. He said it must be light enough so that it can be carried regularly from place to place or as a second choice that it be practical for each mine to afford one to use in checking the sense of sounding of each underground employee.

P. A. Grady, superintendent, Carrs Fork Coal Co., said that as a result of alerting his men to the danger of roof falls they have suffered no fatalities from that cause in the last two years. R. C. Thomas, general superintendent, North-East Coal Co., Thealka, Ky., said the "Book of Rules," which he recalls as an effective safety measure of 1912 and largely supplanted by the State mining law, might well be revived. Mr. Cobb mentioned records showing that 55 percent of the fatalities occur between the last timber and the face and expressed the opinion that there is the place to decrease accidents. W. H. Tomlinson, district engineer, Bureau of Mines, Norton, Va., put more blame on willingness to take a chance than on ignorance of the character of the roof.

Moss Patterson, until recently chief of the Kentucky Department of Mines and Minerals, reported on fires and explosions in the State in 1945 up to the time of his departure to become a member of the firm of Robinson & Robinson, consulting engineers. No major explosions occurred but there were two minor explosions in truck mines, one caused by shooting black powder in a dusty mine and the second by a windy shot.

Of the 21 mine fires, he chose two to describe briefly. One at a mine of the Columbus Mining Co., Perry County, was started by 250 ft. of energized rubber cable coiled at the rib. Thirty-six feet of the rib was ignited before the fire was put out by chemical extinguishers. He said that live cables coiled on coal dust constitute one of our worst fire hazards today and that more portable fire extinguishing units are needed in the mines.

Introduction of a truckload of carbon dioxide, cost $960, through a 200-ft. borehole to extinguish a sealed fire in a mine of the Norton Coal Corp., Hopkins County, proved a time saver and a good method. The CO_2 was introduced through a 2-in. pipe placed inside of the 4-in. casing of the hole, thus allowing relief to the atmosphere for the increased volume of gases. Cooling effect of the gas was considered a valuable factor in extinguishing the fire. Mr. Patterson suggested that in the case of a fire in a seam under cover too thick to drill quickly the CO_2 can be introduced via the underground workings through pipes in the seals.

Mr. Cobb told of the West Kentucky Coal Co.'s solution of cable explosion and fire hazards. It consists of circuit breakers in portable junction boxes feeding cables connected to face equipment. From a trial of a few units in North Diamond No. 2 mine, officials conclude that the trouble has been completely overcome.

Resolutions passed by the institute include one asking a change in legislation or a different interpretation to eliminate pay for first-aid training and a recommendation that the Commonwealth appropriate $89,000 for the Department of Mines and Minerals for the coming fiscal year. In discussion from the floor it was reported that the first-aid legislation or ruling has practically killed that activity in Kentucky during the last two or three years.

A. D. Sisk, chairman of the committee on the mine foreman's guide or "Reference Book," reported that of the 5,000 copies published at the first printing the institute has already sold enough at $1.50 per copy to defray the expense of the printing. The book also has wide usage at Virginia mines. B. E. Schonthal, secretary-treasurer of the Illinois Mining Institute, upon invitation from the chairman, outlined the factors he credits as responsible for the large membership in the Illinois institute.

NEW OFFICERS, KENTUCKY MINING INSTITUTE

President—George M. Humble, chief engineer, Stearns Coal & Lumber Co., Stearns.

First Vice President—V. D. Picklesimer, general superintendent, South-East Coal Co., Seco.

Second Vice President—S. J. Dickenson, general manager, Mary Helen Coal Corp., Coalgood.

Third Vice President—O. W. Evans, general superintendent, N. & W. Ry. Fuel Department, Williamson, W. Va.

Secretary-Treasurer—A. D. Sisk, safety director, Big Sandy-Elkhorn Coal Operators' Association, Pikeville.

Directors: C. Prewitt Gum, general manager, Wisconsin Coal Corp., Wiscoal; Paul M. Jones, civil and mining engineer, Jones & Donan, Madisonville; E. F. Wright Jr., general manager, Clover Splint Coal Co., Closplint; R. H. Thomas, chief, Department of Mines and Minerals, Lexington; E. R. Price, general superintendent, Inland Steel Co., Wheelwright; Bradley Sparks, vice president, and general manager, Luzerne-Graham Mining Co., Greenville; F. M. Medaris, vice president and general manager, Harvey Coal Corp.; L. P. Johnson, vice president and general manager, Crummies Creek Coal Co., Crummies; Harry LaViers, vice president, South-East Coal Co.; J. P. Upchurch, superintendent, Atlas Coal Co., Middlesboro; Brent Hart, president, Hart Coal Corp., Mortons Gap; B. W. Whitfield, Jr., general manager, Bell Coal Co., Rella; C. S. Crouse, head, Department of Mining and Metallurgical Engineering, University of Kentucky, and F. P. Kerr, general manager, Eastern Coal Corp., Stone.

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Hanna Big Stockholder In Pittsburgh Consol

M. A. Hanna Co., Cleveland, will become the largest stockholder in Pittsburgh Consolidation Coal Co., America's largest commercial bituminous coal producer, upon completion of plans for merging Bessemer Coal & Coke Corp., Pittsburgh, into the Hanna company. The merger will bring under Hanna's direct ownership the Bessemer company's stock holdings in the recently formed Pittsburgh Consolidation Coal Co., of which President George M. Humphrey of the M. A. Hanna Co. is a director.

The Hanna company held a special meeting of its stockholders Dec. 18 to approve the merger, which had already been approved by Hanna and Bessemer directors, and was acted upon by Bessemer stockholders Dec. 14. George H. Love, president of Pittsburgh Consolidation Coal Co., becomes director of the M. A. Hanna Co. in connection with the merger.

In a letter to Hanna stockholders mailed Dec. 7 Mr. Humphrey said: "We believe that it is desirable for the Hanna company to unite the assets of the Bessemer company with its own by merger and thus acquire directly Bessemer's entire holding in the Pittsburgh Consolidation Coal Co.

"The Hanna company and its associated companies distributes large tonnages of coal to many customers throughout the entire region of the Great Lakes and Canada. Through association of this wide distribution with this enlarged source of supply, the Hanna companies are not only able to give a wider selection of coals and better service

INCENTIVES FURNISH THE DRIVE

THE COMING YEAR, 1946, and the years to follow can bring unprecedented prosperity to the people of the United States if the incentives to secure it are provided.

We have the advantage of starting with an economy which has demonstrated a capacity for expansion unequalled in any other country in the world. Our economy has demonstrated, also, one grave weakness—a recurring interruption of the upward trend of production and living standards by wasteful and paralyzing periods of recession. Recovery from each depression always has carried us to new heights of economic welfare, but the toll of the years of blight has been harmful to everyone.

The job ahead of us is a dual one. We must maintain the vitality of an economy which, over the years, has yielded an enormous increase in the American standard of living, and we also must improve its stability.

The Dynamics of American Production

In the last prewar year, 1940, the population of the United States was 3⅓ times as large as it was in 1870. But the national production, measured in dollars of constant purchasing power, was 10 times as large at the end of the period, and industrial output had increased 20-fold.

In the meantime, the average number of hours of factory workers had been reduced from about 63 per week in 1870 to less than 40 in 1940, while average hourly earnings had more than trebled in dollars of constant purchasing power. Thus "real" weekly or annual wages in manufacturing had doubled over the 70-year period, even though the work-week was cut by 35 per cent. This was made possible chiefly by a tremendous increase in the quantity and quality of the mechanical facilities which were provided in American manufacturing industry. Manufacturing capital investment per worker was multiplied by 6 times over the period in question. But the return per dollar invested, while it has fluctuated widely between good years and bad, showed no general upward trend over that portion of the period for which measurement is practicable.

Incentives in American Manufacturing

There has been, historically, a remarkably consistent pattern in the division of the realized income from the expanding manufacturing output of America. Reliable statistics are not available for as far back as 1870, but from 1899 through 1939 the average share of wages and salaries has been 82½ per cent against 17½ per cent as the share to investors (including dividends, interest, rents, royalties, and non-corporate profits). There have been, from year to year, relatively minor divergences from this pattern of distribution, but there is no discernible trend during the period away from the averages cited.

It is suggested that the persistence of the average 17½ per cent share of realized income from manufacturing that was maintained for the 40 years preceding World War II may represent the proportion that is needed to produce the dividends, interest, rents, royalties, and non-corporate return that will provide for the continuing investment upon which an expanding productivity such as we have had in the past depends. At any rate, it would seem reckless to depart too radically from such an established pattern at a time when unprecedentedly large private capital investment is counted on to make up for the drastic curtailment of such investment during the war years, and to carry us to the new high levels of civilian production set as our postwar goals.

The Distribution of Manufacturing Income in War

At the beginning of the war, the Government adopted controls and a tax program designed to prevent wartime activity from resulting in un-

duly swollen private returns. Due primarily to huge volumes, the profits *before* taxes of manufacturing industry were very high, but throughout the war its profits *after* taxes averaged returns no larger than they had been in good prewar years. Relative to volume, they were considerably lower than in prosperous years in the past. Again, there can be no complaint at results that generally were in accord with a national wartime policy.

But it is fair to note that the wages of manufacturing labor were allowed to increase substantially during the war. Between January 1, 1941 and April, 1945, average weekly earnings per worker increased by 77 per cent. This was, in considerable part, a result of increased working hours and a shift from low- to high-paid industries, but straight-time hourly earnings on the same jobs increased about 40 per cent against a cost-of-living rise of about 30 per cent.

The net result was to alter drastically the 40-year relationship of the 17½-82½ per cent division of Realized Income from Manufacturing. The share of wages and salaries increased to over 90 per cent, and the investment share shrunk to less than 10 per cent.

Its Postwar Distribution

This wartime shift in the proportion of distributive shares has an important bearing upon current wage controveries. With union demands for wage increases ranging up to 30 per cent, and the economists of the Office of War Mobilization and Reconversion asserting that an average increase of 24 per cent is feasible without raising prices, it is pertinent to inquire how such increases would affect the prewar ratios that governed realized income distribution in manufacturing.

Forecasting is always hazardous, but if we assume (1) that in 1946 we shall reach the $160 billion level of national output which the Government proponents of general wage increases expect, and (2) that there will be little increase in productivity because of the continuing process of reconversion, and (3) that the Government will succeed in carrying its announced purpose to maintain present price ceilings, it appears that a 24 per cent general wage increase would reduce the share going to capital from 17½ per cent to 11 per cent even allowing for its increased return resulting from the repeal of the excess profits tax. The prewar ratios would be about maintained if wages remained at present levels.

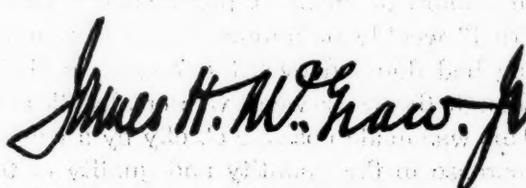
Conclusion

Since the maintenance of these prewar ratios was accompanied by an unparalleled rise in the "real wage" of American workers, there is a powerful prima facie case for not tinkering with them. It should be noted, however, that some economists think that the size of the investment share of manufacturing income tends to provide more capital than can be absorbed by a mature economy, and thus contributes to those breaks in the expansion of the economy which, as stated at the outset, have been its principal blight.

Regardless of what may ultimately prove to be the validity of this view, no one can responsibly contend that at this early but crucial stage in the reconversion process is the time to test it. Now, no one knows whether, or what dimension of, additional wage increases can be supported without forcing up prices or reducing profits to a point that will discourage vitally needed private capital investment.

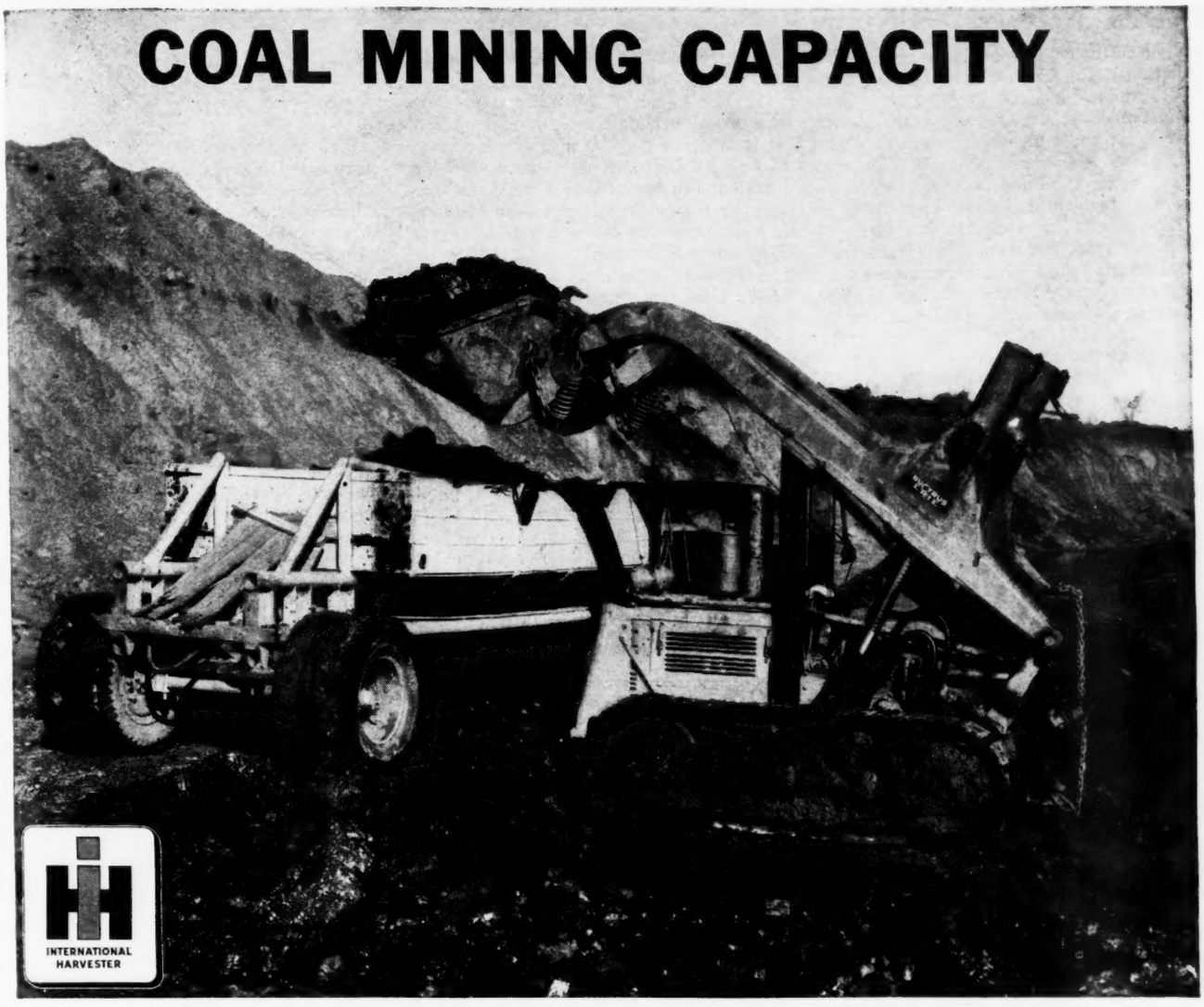
We want high and increasing wages in American manufacturing. We need them to provide an active incentive to workers to support expanding productivity, as well as to continue the trend of rising living standards in America. Equally, we need a continuing profit incentive of sufficient attractiveness to call forth the new investment upon which expanding productivity depends.

We can never attain our dual objective if we push one of these aims so far and so fast that it defeats the other.



President, McGraw-Hill Publishing Co., Inc.

COAL MINING CAPACITY



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International TracTracTors are handling the tough jobs in strip mining operations like this all over the country. In many mines, powerful Internationals are used to strip off the overburden as well as to remove and load the coal. Wherever they're put to work, they can be depended on to stand up under hard usage and perform efficiently.

Stamina and durability are built into International Crawlers. That's why they deliver peak performance day in and day out under difficult conditions. They're *engineered* for the tough jobs.

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Industrial Power Division

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INTERNATIONAL Industrial Power

to our customers but should be able to give additional tonnage and better working time to the mines operated by Pittsburgh Consolidation Coal Co. This in turn should give larger and more stable earnings to that company's thousands of employees and create better conditions in the several communities that are dependent upon them."

The merger terms provide that shares of Bessemer stock not owned by Hanna shall be converted into Hanna common stock. For this purpose Hanna will issue 58,700 shares of additional stock. As Hanna recently acquired 45,197 shares of its own stock through another transaction, after the merger the company will have outstanding a total of 1,030,464 common shares, as compared with 1,016,961 shares outstanding a year ago.

•

Foremen Group Okayed As Bargaining Unit

In a decision of far-reaching importance to industry, the National Labor Relations Board on Dec. 8 directed the Packard Motor Car Co. to bargain, upon request, with the Foremen's Association of America as the exclusive representative of the company's foremen at its plant in Detroit. The order was signed by Chairman Paul M. Herzog and Member John M. Houston. Board Member Gerald D. Reilly dissented.

In a special concurring opinion, the new chairman of the Board, Mr. Herzog, stated that the Board has always unanimously held foremen to be employees within the meaning of the National Labor Relations Act and added: "Although there has sometimes been a tendency to assume that the issue before us is whether foremen should or should not join unions, that assumption misconceives the Board's function. We are faced, instead, with the narrower question of whether . . . the act affords them access to the orderly administrative machinery that is concededly available to rank-and-file employees. I think that it does."

Ohio Group Studies Strip Operations

After inspecting coal mines in Perry and Hocking counties, Ohio, Nov. 29, Governor Frank J. Lausche accompanied Ohio's Strip-Mine Investigating Commission as far as Nelsonville on its way to the Fairmont (W. Va.) area to inspect strip operations as part of a study to determine whether legislation regulating such mining should be recommended to the General Assembly.

Governor Lausche has called for regulatory laws and has indicated he would ask a special session this winter to consider the problem, one of the most controversial to arise during the last regular meeting. When its tour of inspection has been completed the commission is to make recommendations for regulation of strip mining. Senator Evert Addison, Columbus, chairman of the nine-member commission named to recommend legislation, asserted Dec. 14, however, that it probably would be April before the group could draft a bill.

Senator Joseph T. Williamson proposed at a recent hearing that a severance tax of 4c. a ton be levied on all strip-mined coal, to be used by the State Conservation Department to restore the land for agricultural use. He presented his proposal in the form of a bill for a commission to consider. Operators would be required to register with the Conservation Department and pay a fee of $100. Operations producing less than 100 tons a year would be exempt.

Some witnesses at the hearing said it would be preferable that restoration of the land be required of the operators, who would give bond for such performance, rather than the severance tax. Wayne Hames, former State Senator from Belmont County, said that fly-by-night operators from Pennsylvania and West Virginia were doing most damage to the lands and were avoiding payment of increased tax assessments levied by Belmont County on such coal lands. He asserted that many irresponsible operators had inadequate capital and equipment and abandoned their undertakings before the county could collect taxes from them.

COAL ACTIVITY

Bituminous Coal Stocks

Thousands

	Net Tons Nov. 1, 1945	P.c. Change From Oct. 1, 1945	P.c. Change From No. 1, 1944
Electric power utilities	15,138	−2.6	−15.7
Byproduct coke ovens	3,677	−20.5	−42.5
Steel and rolling mills	548	−26.5	−31.2
Railroads (Class I)	10,099	−7.2	−31.3
Other industrials*	14,291	−12.0	−26.4
Total	43,753	−8.9	−26.2

Bituminous Coal Consumption

Thousands

	Net Tons Oct. 1945	P.c. Change From Sept. 1945	P.c. Change From Oct. 1944
Electric power utilities	5,565	+4.7	−17.6
Byproduct coke ovens	5,631	−21.0	−29.5
Steel and rolling mills	798	+18.6	−7.8
Railroads (Class I)	9,691	+4.7	−11.9
Other industrials*	10,366	+5.2	−16.8
Total	32,151	+1.9	−17.6

*Includes beehive coke ovens, manufactured-gas plants and cement mills.

Bituminous Production

November, 1945, net tons	50,720,000
P.c. change from November, 1944	+1.0
January-November, 1945, net tons	527,138,000
P.c. change from Jan.-Nov., 1944	−8.2

Anthracite Production

November, 1945, net tons	4,533,000
P.c. change from November, 1944	−10.6
January-November, 1945, net tons	50,626,000
P.c. change from Jan.-Nov., 1944	−15.4

Sales, Domestic Stokers vs. Oil Burners

	Stokers	Burners
October, 1945	19,372	19,324
P.c. change from Oct., 1944	+290.3	+388.3
January-October, 1945	90,998	79,006
P.c. change from Jan.-Oct., 1944	+216.5	+211.4

Index of Business Activity*

Week ended Dec. 22	173.3
Month earlier	169.7
Year earlier	231.4

*Business Week, Dec. 29.

Electric Power Output†

Week ended Dec. 22, kw.-hr.	4,239,376,000
P.c. change from month earlier	+10.4
P.c. change from year earlier	−8.2

†Edison Electric Institute.

Export Coal Plans Are Revealed

Bids were received Dec. 14 by the Procurement Division, Treasury Department, at Washington for service in handling coal shipments for export to liberated areas abroad during the first half of 1946. Both bituminous and anthracite are involved in the government's export program, which calls for shipments of an estimated 2,000,000 tons per month during the first three months, January to March. The Procurement Division, however, says the program may continue for the second quarter.

The call for bids indicated the coal to be exported under the program is to be "directed" by the Solid Fuels Administration, which will name the mines, producers or shippers from whom it may be obtained. The coal will be purchased by the U. S. Government for export to foreign governments from ports designated. Bidders may submit flat rates for all ports concerned or alternate bids for various ports.

John W. Snyder, Director of War Mobilization and Reconversion, acted Dec. 8 to break the bottlenecks that have prevented the flow of coal to liberated regions in sufficient quantities to meet relief needs. He stated that the State Department had informed him that coal shipments had been lagging 25 percent behind schedule during the preceding five months.

Of the 8,113,000 tons of coal that the United States promised to send to the liberated countries by the end of the year, less than 6,000,000 tons would actually be exported, Mr. Snyder stated. Allocations and shipments through December are shown in the following table:

	Allocated	Shipments	Deficits
Aug.	1,231,000	1,025,000	206,000
Sept.	1,470,500	1,390,000	80,500
Oct.	1,787,000	684,000	1,102,600
Nov.	1,782,500	1,321,200	461,300
Dec.	1,842,000	*1,500,000	342,000
Total	8,113,000	5,920,600	2,192,400

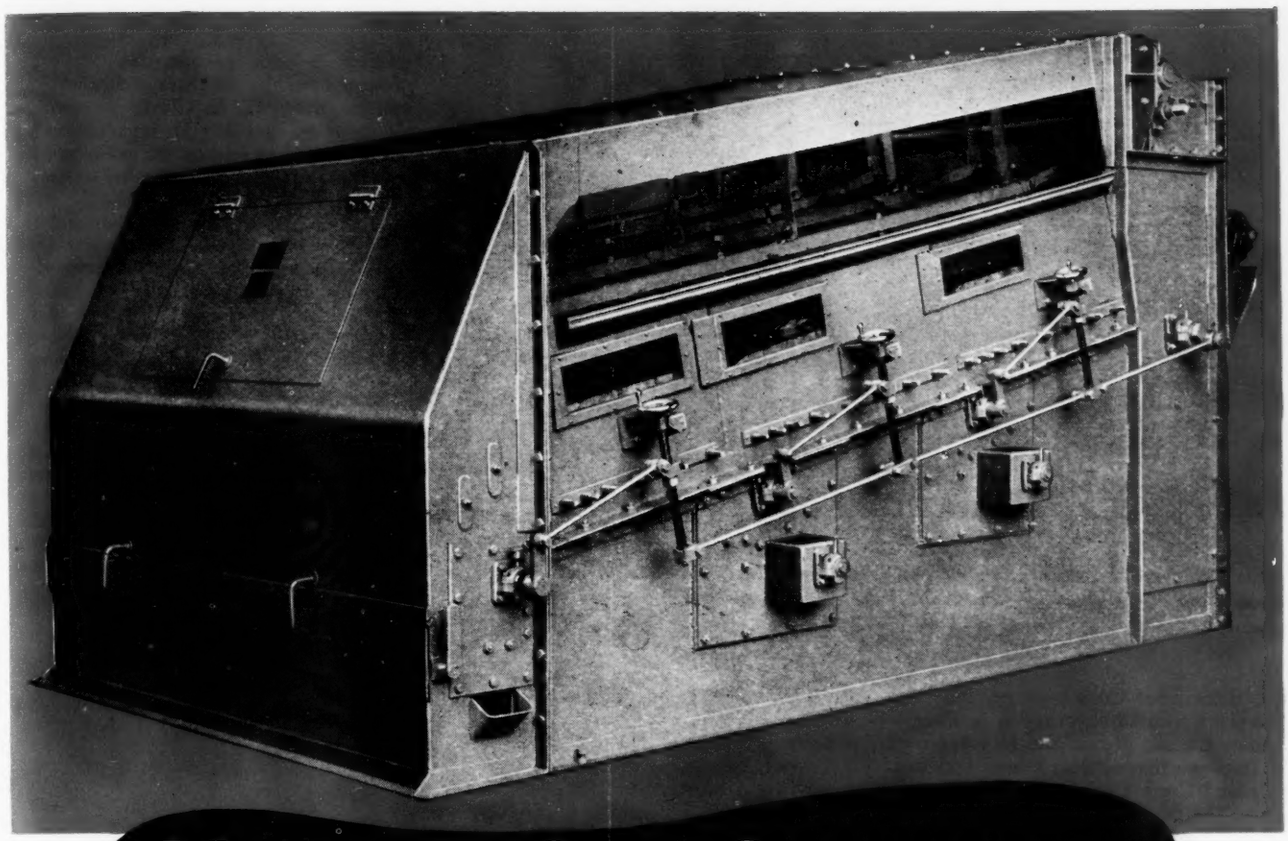
* Estimated

Although Hampton Roads, Norfolk, Newport News and Portsmouth, Va., are capable of handling 1,000,000 tons of coal a month, the port is loading only a fourth of that quantity.

West Ky. Institute Reviews Progress

After a 150-plate turkey dinner Nov. 27 at Madisonville, Ky., C. H. Moore, president, Kentucky Coal Agency, took charge of the Western Kentucky Mining Institute program, calling attention to the increase in coal production in that area from a prewar annual average of eight million tons to 20 million tons in 1944. Furthermore, the fatalities from mine accidents have been reduced to seven a month, the lowest in Kentucky history. These benefits he attributed largely to the effective safety work of the Western Kentucky Mining Institute.

Following brief remarks by Aubin Higgins, retiring president, and by several members and visitors from nearby areas, T. A.



MAXIMUM COAL CLEANING . . .

per dollar invested

Island Creek Coal Co., Holden, W. Va. prepares coal from five mines with Stump Air-Flow Cleaners. 15 units are in operation. A typical flow sheet at Mine No. 16 includes R & S Hydro-Separators for coarse coal washing and R & S Air-Flow equipment for fine coal dry cleaning.

R & S Stump Air-Flow Cleaner, for dry cleaning of your coal when desirable, is low in first cost, low in maintenance and high in capacity. The Air-Flow Cleaner occupies a minimum of floor space and needs little attention, yet it cleans up to 100 tons of coal per hour, depending upon the size and cleaning characteristics of the coal and the width of box used.

For maximum coal cleaning per dollar invested get full information about the R & S Stump Air-Flow Cleaner—Bulletin No. 163.

Coarse coal can be prepared economically in the popular R & S Hydro-Separators. Ask for Bulletin No. 161.

The R & S Hydrotator for washing coal in finer sizes is another R & S engineering achievement. Described in Bulletin No. 162.

R AND S COMPANY

ROBERTS and SCHAEFER CO.

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HUNTINGTON, W. VA.

NEW WESTERN KENTUCKY OFFICERS

Left to right—William H. Kington, president; Arthur Wilson, first vice president; Herbert Hinton, second vice president; Lindsay Cobb, third vice president, and Thomas O. Long, secretary-treasurer.

Day, Bituminous Coal Institute, Inc., outlined the work that organization is doing to promote the sale of coal and to broaden its use. In connection with his former work with the Island Creek Coal Co. he called attention to the greeting encouraged among the miners of that company. The first man would raise his hand and say, "Be careful." The reply would be, "Be careful."

Officers elected for the coming year were: William H. Kington, president; Arthur Wilson, first vice president; Herbert Hinton, second vice president; Lindsay Cobb, third vice president; Thomas O. Long, secretary-treasurer; chairman membership committee, Paul M. Jones, and chairman program committee, Earl T. Smith.

•

Dieselization Nears Completion on Monon

Dieselization is nearing completion on the Chicago, Indianapolis & Louisville R.R. (Monon) and most of the Chicago, Burlington & Quincy R.R.'s passenger trains are so equipped, it was reported Dec. 12. Judge Igoe, U. S. District Court, entered an order in the Monon bankruptcy case granting permission to purchase 19 diesel locomotives and 15 streamlined passenger cars, at a cost of $5,550,000, which will give the road "virtually complete dieselization" of all its trains, it was asserted. The Interstate Commerce Commission indicated approval of such a purchase some time ago, but replacement of old service by diesel-powered streamlined trains between Chicago, Indianapolis and Louisville is contingent on proceedings pending before the Public Service Commission of Indiana.

Simultaneously H. C. Murphy, vice president of the Burlington, stated that, beginning Dec. 13, all passenger trains between Chicago, Omaha and Denver would be dieselized, as would several trains on other important passenger runs. The Burlington achievement was effected by delivery within a few weeks previous of ten new 4,000-hp. diesel locomotives and the pooling of these with five similar units acquired before the war. Including its Zephyrs, the line now has 27 diesel passenger locomotives and 16 diesel freight locomotives.

•

Riffe Branch Mine Ready to Ship Coal

Riffe Branch mine, new operation of the Winding Gulf Collieries Co., in southern West Virginia, is ready to begin shipping coal as soon as the Virginian Ry. completes a short spur track being constructed, according to L. V. Summers, superintendent. Tipple machinery and duckbill loaders probably will not be delivered until February, he said, but until then coal will be hand-loaded through a temporary tipple.

Tipple equipment will include an air cleaner and washer, as well as a rotary dump that will load five railroad cars at a time, each with a different grade of coal. Mr. Summers said that the company would employ about 300 men and average 3,000-3,500 tons per day when full production was reached.

•

Bluefield Coal Show To Be Resumed

Bluefield's (W. Va.) Southern Industrial Exhibition is to be resumed next August, it was decided at a meeting of the exhibition's general committee at Bluefield Dec. 6, when Lewis C. Tierney, president, Eastern Coal Sales Co., was elected general chairman. The last exhibition was held in 1941, having been dispensed with for the last four years because of the war.

The event is sponsored by the Pocahontas Electrical and Mechanical Institute in cooperation with the Pocahontas Operators' Association, the wholesale distributors, railroads and other interested groups in Bluefield and adjacent coal fields. At the Dec. 6 meeting, held in the operators' offices and presided over by William Beury, Algoma coal executive, C. L. Cloyd, president of the institute, said that his organization had recently voted to resume the exhibition if it met with the approval of other interested groups.

Mr. Tierney, general chairman, said that B. B. Housman, of the Pocahontas Operators' Association, would again serve as director of the exhibition—a job he has held since it was started in 1934—and that it would be held Aug. 22-24 in the Norfolk & Western Ry.'s spacious freight terminal.

Participated in by upward of 200 of the nation's leading equipment manufacturers, the show normally attracts around 50,000 visitors a year—principally the skilled men of the mines who actually use the equipment on display. In the years just before the war the affair was broadened to include other events such as a reunion of the field's pioneer miners, a gadget contest, lectures and motion pictures.

Other members of the general committee present at the meeting were O. M. Dawson, C. E. Lilley, W. E. E. Koepler, Lon M. Rish, H. B. Smith, Sam Worley, John Rodrian, L. W. Bates, Eddie Steele, Earl Rich, L. E. Tierney and G. L. Furr.

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Name Post-War Planning Committee

Meeting in New York Dec. 11, the Anthracite Institute appointed the following as representatives on a post-war retailer-operator committee: W. L. Banta, R. L. Birtley, G. C. Cooke, G. B. Fillmore, C. W. Stone, W. O. Trevorrow, J. T. Berta, A. E. Sloat, William Gohl and F. W. Earnest Jr. (ex officio).

At the same time the Eastern States Retail Solid Fuels Conference named these representatives: H. O. Tompkins, John Schreiber, J. Everett Robbie, Leon Walker, Lloyd Jones and Harry Schmidt.

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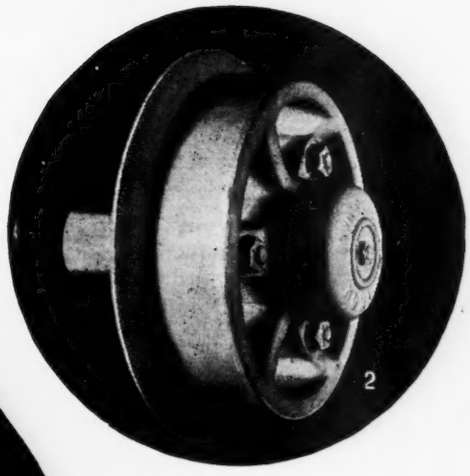
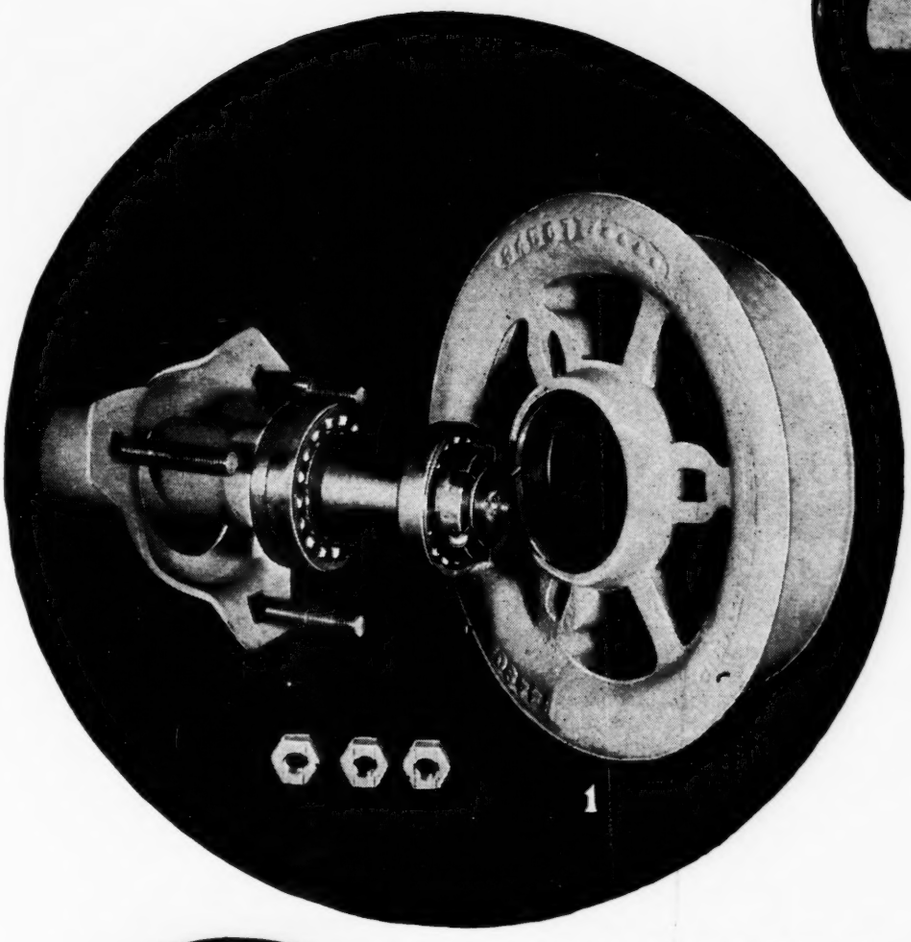
Coal Prices Raised By OPA Order

An immediate increase of 7c. a ton was announced Dec. 20 by the Office of Price Administration in producers' price ceilings for deep-mine bituminous coal from central Pennsylvania, Maryland and part of West Virginia. The increase, applicable throughout District 1, will be passed on to consumers.

OPA said the price boost was mandatory under a directive of the Office of Economic Stabilization requiring that soft-coal ceilings yield each producing district its 1942 profit margin or 15c. a ton, whichever is greater. The increase does not apply to coal produced from strip mines.

In response to an appeal from the industry based on increased production cost, the Office of Price Administration gave authority Nov. 30 for increases of 5 to 65c. a ton in the ceiling prices allowed to producers of anthracite. The nine largest pro-





This Wheel Hates To Be Greased!

The S-D "Floater" despises having people grease him like a 7-year old kid despises soap. The only difference is the 'Floater" seldom needs greasing. You buy them today, grease them once in 5 years. Very seldom do any conditions alter this schedule. Anyway, if you find it necessary to grease "Floaters" more than once in 5 years, we pay the extra cost.

This saving alone will justify many mines installing "Floaters". For those mines who grease their wheels weekly—260 times in five years—this cost is tremendous, both in grease and labor.

Remember, the S-D "Floater" is a Ball Bearing Closed Hub Wheel. Tests prove that with the installation of "Floaters" you can increase the net loads handled by your locomotive up to 50 per cent. A real power saver.

We guarantee "Floaters" against breakage, undue wear on bearing failures for 5 years. But, if demounting is necessary, you can do it in only a few minutes by removing 3 nuts. Bearings remain on axle in perfect adjustment as shown in Photo 1.

Photos 2 and 3 show the front and rear of the "Floater" and how it is held in place with only 3 bolts. Check up on your present wheel maintenance cost. The chances are you need "Floaters". Write for our Free Trial Offer.

Sanford-Day Iron Works KNOXVILLE, TENNESSEE

ducers receive an increase averaging 11.6c. a ton, while the average for all others is 32c. OPA said that the adjustment, which became effective Dec. 1, could be passed on to consumers to the exact amount of the increase.

The companies that obtained the average 11.6c. increase are the Glen Alden, Lehigh Valley, Lehigh Navigation, Jeddo-Highland and Pennsylvania coal companies, Philadelphia & Reading Coal & Iron Co., Susquehanna Collieries Co., Stevens Coal Co. and The Hudson Coal Co. These companies are given the right to an increase of 15c. a ton on broken, egg, stove, nut and pea coal; 10c. on buckwheat and 5c. on rice and barley. Independent producers are permitted to raise prices 65c. a ton on broken, egg, stove, nut and pea; 55c. on buckwheat and 5c. on rice and barley.

These increases have been granted, explained the price agency, to provide the industry until April 30, 1946, with the equivalent of its 1942 margin, which was 19.9c. a ton.

•

Mine Official Rewarded for Safety

In recognition of his outstanding safety achievements, Governor Edward Martin of Pennsylvania has presented to Charles Morris, assistant mine foreman, Olyphant colliery, Hudson Coal Co., Scranton, Pa., an approved type of miner's flame safety lamp, inscribed with his record.

Mr. Morris has spent 40 years of his life as an employee of The Hudson Coal Co., having started as a breaker boy at the age of twelve. He has been an assistant mine foreman in the Miles Slope of the Olyphant colliery of The Hudson Coal Co. for more than 20 years. During this period he supervised the work of 60 men in his section, who have produced 1,160,490 tons of coal without a single roof-fall injury.

The record attained by Mr. Morris has been in a section of the mine where roof conditions are such that they require careful attention. Mr. Morris developed the practice of having the miners immediately examine their roofs when an assistant mine foreman walked into the place. The miners also were trained by him to examine the roof frequently during the day. He was the first assistant mine forman employed by The Hudson Coal Co. to have all the men under his jurisdiction fully equipped with hard hats, goggles and safety shoes. During the last ten years, Mr. Morris has received four Certificates of Honor from the Joseph A. Holmes Safety Association for outstanding safety records.

•

Hirst to Head Hydrogenation Plant

Dr. Lester L. Hirst, Pittsburgh, Pa., a pioneer in American research on synthetic fuels, has been appointed acting chief of the new hydrogenation demonstration plant to be established by the U. S. Bureau of Mines at the Missouri Ordnance Works, near Louisiana, Mo., it was announced Dec. 18 by Dr. R. R. Sayers, Director of the Bureau. On behalf of the Bureau, Dr. Hirst accepted custody of the $17,500,000 works —a war-time synthetic ammonia producer— from the Army Quartermaster Corps Dec. 15, Dr. Sayers added. Following a period of conversion, the plant will begin producing gasoline and oil on a demonstration basis from coal and lignite—in about a year, it was estimated.

In taking over the ordnance works, the Bureau of Mines will retain some of the employees of the Hercules Powder Co., which operated the plant during the war, and several civilian employees of the Ordnance Department, it was said. A few design and construction workers will be added during the conversion period, Dr. Sayers states, but the staff will not be increased materially until production has begun. At that time, personnel will be increased to about 225. Ultimately, when both the hydrogenation and gas-synthesis units are put into operation, the Bureau expects to have between 250 and 325 employees at Louisiana. Recruitment will be done through the office of the Ninth Civil Service District, St. Louis.

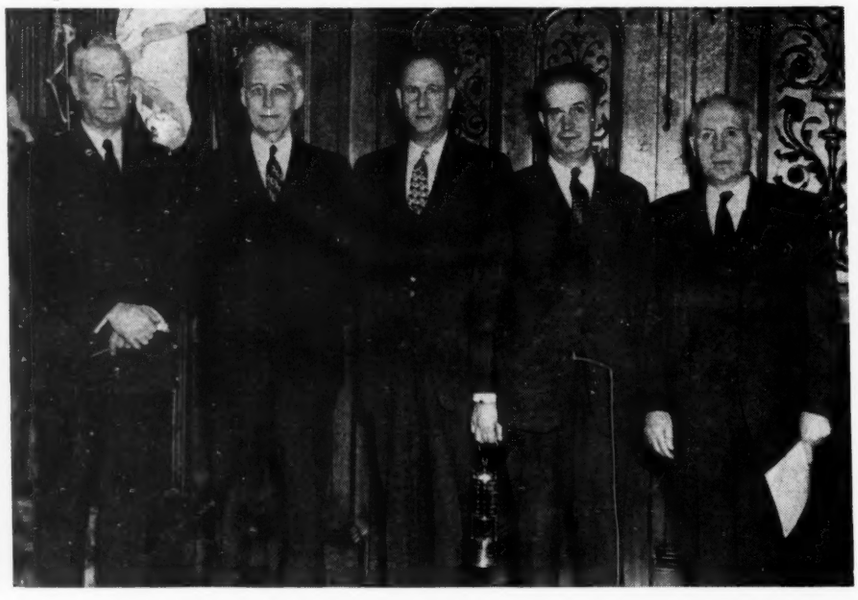
Other appointments to the hydrogenation plant staff include D. S. Taylor, Otis, Kan., as chief of plant maintenance, and J. A. Markovits, Pittsburgh, Pa., as second assistant to Dr. Hirst. Both of these men, as well as Dr. Hirst, already were employees of the Bureau of Mines.

To save time in carrying out the objectives of the synthetic liquid fuels research and development program, the U. S. Bureau of Mines has taken steps to bring to this country several thousand tons of equipment and supplies from captured German and Japanese synthetic fuel plants and laboratories, Dr. R. R. Sayers, director of the Bureau, disclosed Dec. 13. The Navy Department has volunteered to aid the Bureau in obtaining hydrogenation and oil-refining pilot-plant units found intact at a Japanese naval installation, and requests have been submitted to the War and Commerce departments for similar assistance in obtaining German equipment for test purposes. Most of Germany's synthetic fuel plants are in the British and Russian zones of occupation, but the equipment desired also is available in areas occupied by American forces.

At the same time, Dr. Sayers said, the Bureau has agreed to cooperate with the Navy Department in a mission to investigate Japanese developments in the fields of synthetic fuels, petroleum and lubricants. Information obtained is expected to aid both the Navy and Interior departments. Bureau engineers recently returned from a similar mission to Europe, where they inspected the bomb-twisted remnants of German synthetic liquid-fuel plants, interrogated plant personnel, and collected plant-operation and research documents.

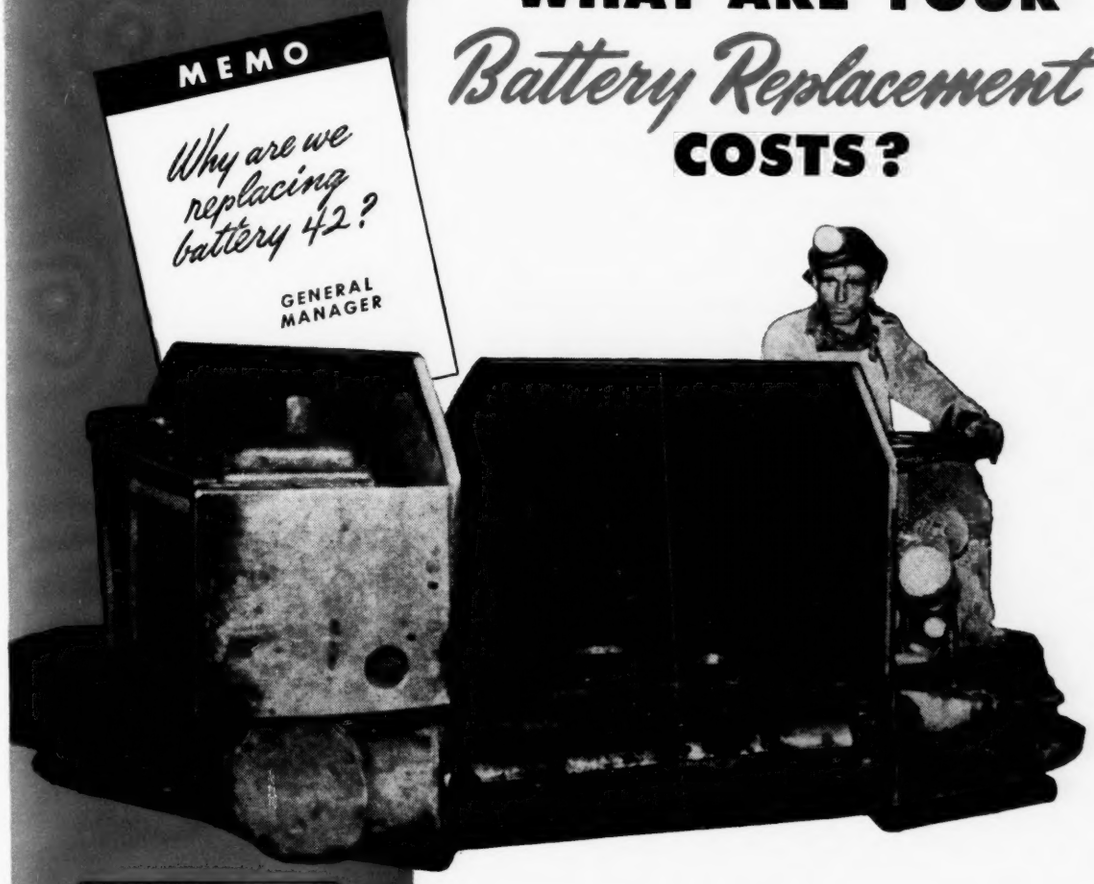
Russia, too, according to published reports, is vitally interested in synthetic liquid fuels, even though its natural petroleum reserves are virtually untouched when compared with the intensively developed oil fields of the United States, which yielded 8,866,000,000 bbl. during the war—far more than was discovered in that period. Tass, the official news agency of the U.S.S.R., recently announced the start of construction of two synthetic fuel plants, one of which is designed to yield 500,000 metric tons of liquid fuels annually. This plant will occupy 750 acres and consist of some 900 buildings, Tass said, a development that alone dwarfs the five-year research and development program authorized by Congress for the U. S. Bureau of Mines. At the same time, new Soviet oil-well drilling is reported to have reached an unparalleled peak.

Award of a $995,000 contract to the Navarro Corp., Pittsburgh, Pa., for general



At the presentation, left to right: Governor Edward Martin; Edgar C. Weichel, assistant general manager; John M. Reid, general superintendent; and Charles Morris, sectional foreman, The Hudson Coal Co.; Richard Maize, Secretary of Mines of Pennsylvania.

WHAT ARE YOUR *Battery Replacement* COSTS?

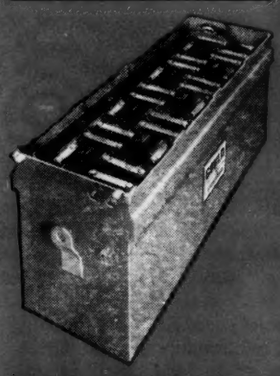


Gould Kathanode power will speed your mine shuttle car operation throughout the entire service life of the battery. You will not have to replace it because of failing power after a few months of use.

One reason why Gould delivers 100% or more of its rated capacity through years of service is the large positive plate filled with Black Oxide active material. Developed by Gould engineers this active material has unique regenerative properties. As the outer surface is used up new material takes its place. Capacity is maintained.

Avoid operational slow-downs and premature battery replacement by powering with Gould. Write Dept. 111 for Catalog 300 on Gould Kathanode Glassklad Batteries for Mine Shuttle Car Service.

BLACK OXIDE
Made by a special Gould process each grain of Black Oxide active material has a core of pure lead. Normal cell action converts this to active material as needed.



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GOULD
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construction work to complete the major buildings of the new Bureau of Mines synthetic fuels research and development laboratory, near Bruceton, Pa., has been announced by Secretary of the Interior Harold L. Ickes. Work will begin five days after the contractor receives an executed copy of the contract and will be completed within 350 days. The job includes the provision of all labor, materials and appliances required to complete the warehouse building, boiler plant, coal-hydrogenation laboratory building, gas-synthesis laboratory building, sewage-disposal plant, oil-storage building, pumphouse, and bridges connecting the warehouse building with the coal-hydrogenation and gas-synthesis structures.

Construction already is advanced, according to Dr. R. R. Sayers, director of the U. S. Bureau of Mines, on grading the site, installing building foundations, structural steel, boilers, reservoir tank, underground water, sewer and gas lines, macadam roads, and a boiler plant smokestack, all such work having been initiated under previous contracts. Contracts will be awarded later for elevators, traveling cranes, coal and ash conveyors, an ash silo, and plumbing, heating, and electrical installations.

The laboratory at Bruceton will be operated in conjunction with a synthetic liquid-fuel demonstration plant to be established near Louisiana, Mo., where the Bureau of Mines is taking over the Missouri Ordnance Works.

•

Mine Negligence Not Proved

Three officials of the Henry colliery of the Lehigh Valley Coal Co., Plains, Pa., charged with negligence in connection with the deaths of three men and the serious injury of three others in a mine explosion there on Aug. 2, were cleared of the charge in a lengthy ruling handed down Dec. 4 by President Judge W. Alfred Valentine.

The men named in the proceedings, charged with violations of the Mining Act of 1891 in failing to provide proper protection in the mine, were Herbert C. Griesing, superintendent; Charles Gardiner, mine foreman, and Charles Neyhard, assistant colliery foreman.

Judge Valentine ruled that "the burden of showing that Griesing violated certain sections and an article of the Mine Act has not been established." In regard to the charges against the other two defendants, the court said: "No gas had been found in the accessible parts of the Lower Baltimore vein at any time prior to the explosion of Aug. 2, 1945. Whether the gas that was then ignited came from the Lower Baltimore vein is a disputed fact."

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Mine "B" Reopened

Mine "B," west of Springfield, Ill., on the old Jacksonville Road, has been reopened. It is now operated by the Citizens' Mining & Sales Co. Lewis Waldron, superintendent, heads the new management.

MEETINGS

- **American Society of Heating and Ventilating Engineers: 52d annual meeting, Jan. 28-30, 1946, Hotel Commodore, New York City.**
- **American Institute of Mining and Metallurgical Engineers: annual meeting, Feb. 25-28, Palmer House, Chicago.**
- **American Society for Testing Materials: spring meeting, Feb. 25–March 1, Pittsburgh, Pa.**
- **Midwest Power Conference: Under sponsorship of Illinois Institute of Technology, April 3, 4 and 5, Palmer House, Chicago.**
- **American Mining Congress: annual coal convention, April 29, Cincinnati, Ohio.**

Start Work on New Kentucky Power Plant

Kentucky Utilities Co., largest power and light utility in the State, with headquarters at Lexington and lines over most of Kentucky, started work Dec. 12 on its Tyrone (Ky.) plant on the Kentucky River near Lawrenceburg, in Anderson County. This plant was to have been started some years ago but was held up because of the war. It will cost around $4,250,000 and will be a steam plant, arranged so that it can receive coal in barges on the Kentucky River or by rail from eastern Kentucky mines.

•

Island Creek to Open New Mine in Mingo

Island Creek Coal Co. has reported plans to open a new mine in the Pigeon Creek district on Rockhouse Fork, Mingo County, West Virginia, with full operations expected about Nov. 1, 1946. President James D. Francis and Vice President R. E. Salvati said the company had taken over additional acreage from the United Thacker company, which Island Creek acquired about five years ago.

At that time the holdings totaled about 22,000 acres, but have been increased since then. Equipment for the new mine will be obtained from the company's No. 14 operation, at Whitman, Logan County, which was worked out early this year.

•

Bicknell Again Wins Templeton Trophy

Knox Consolidated Coal Corp. No. 5 mine, Bruceville, Ind., has won the Templeton Safety Trophy for the second consecutive year, according to a report submitted by a committee to the Indiana Coal Operators' Association. The committee was composed of Jack Ogilvie and C. A. Herbert.

The report covers the year from Nov 1, 1944, to Oct. 3, 1945, for mines in the association. In winning the award the second consecutive year the mine compiled a percentage of 87.56 compared with 74.5 percent a year ago. The report showed there were 245,073 hours of exposure, 216 days lost because of accidents, 12 lost-time accidents, the severity rate was 0.85; and the frequency rate, 48.96.

•

P. & R. Contributes $100,000 to Hospital

At a meeting of representatives of Schuylkill County (Pa.) residents held in Pottsville Nov. 30 Ralph E. Taggart, president, Philadelphia & Reading Coal & Iron Co., infused enthusiasm into the campaign to raise $350,000 for construction of a new modern Pottsville hospital with the announcement that his board of directors had authorized a contribution of $100,000 to the fund.

Declaring he was impressed with the hospital's record in spite of its lack of sufficient facilities, Mr. Taggart asserted that the hospital was not keeping pace with Pottsville's progressiveness and that the city should provide more modern and suitable facilities as a form of insurance to its residents. He added that because of the superior service rendered P. & R. employees and the company's confidence that the venture would be a success, the board had authorized the contribution.

•

Ohio Coal Association Joins Smoke Battle

Impetus was given Dec. 17 to the smoke-abatement campaign in Ohio with announcement that the Ohio Coal Association had joined the organized drive to eliminate the nuisance. The Ohio association, which has its own advisory group to study this problem, has now become a part of the Coal Producers' Committee for Smoke Abatement, formed in 1941 to coordinate and intensify the coal industry's effort toward proper abatement of smoke. The latter organization appointed as director of engineering on Dec. 17 H. B. Lammers, power supervisor, Wright Aeronautical Corp., Cincinnati, according to an announcement by R. E. Howe, chairman. Before joining the Wright corporation at the outbreak of the war as assistant plant engineer Mr. Lammers served for 15 years as test engineer for the Cincinnati Gas & Electric Co.

The Coal Producers' Committee, which offers its aid to help cities rid the atmosphere of pollution, operates on the theory that smoke abatement is a selling job involving improved fuel-burning techniques or the installation of efficient equipment. Ezra Van Horn, executive vice president of the Ohio Coal Association, in announcing that it had joined the producers' committee in this effort, said his association included in its membership firms of the State

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SAFETY MINDED operators—and they grow more numerous daily—recognize the Whaley "Automat" as the coal industry's safest loader.

The "Automat" is safe because of its natural and effective method of loading with its vertical lift shoveling action loading head. In closely timbered workings and narrow entries especially, this shoveling action, in a vertical plane, is vital to safety because there is no danger of side-kicking of machine . . . no knocking out of timbers . . . no possibility of crushing men.

In tight shots the "Automat" is particularly effective because it moves straight forward under material, lifts as it simultaneously pulls backward for depositing material on jib conveyor. With such action dangerous jerking of machine from side to side is not possible.

This natural shoveling action is an exclusive feature of the Whaley "Automat" and an important reason why you should consider this machine for uninterrupted performance, maximum tonnage and lowest operating cost.

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that produce about 20,000,000 tons of coal annually.

The coal association will be represented on the committee by Mr. Van Horn and J. B. Grigg, manager of coal sales development, M. A. Hanna Co. Mr. Grigg also is chairman of the Ohio Coal Association Smoke Abatement Advisory Committee. Others on this committee are L. C. Williams, combustion engineer, Lorain Coal & Dock Co.; Homer Faust, resident engineer, New York Coal Sales Co., Columbus; and R. F. Stilwell, special representative, North American Coal Corp.

C.M.I. Delves Into Electric Mine Fires, Communication, Timbering, Washing

MEANS OF PREVENTING mine fires resulting from short circuits and leakage of electricity were discussed in detail by the Coal Mining Institute of America at its 59th annual meeting, Dec. 6 and 7 at Pittsburgh, Pa. Reports were made by six subcommittees of a group of engineers and managers who collaborated in this detailed study at the suggestion of the Pittsburgh Coal Co. A symposium on means of communication underground was followed by another on means of recovering sludge and thereby avoiding stream pollution. Papers also were presented on the use of a timber truck to cut and place roof supports at room faces and on organization of mine inspection districts for handling mine disasters.

Better Trailing Cables

To obtain trailing cables of a more flame-resistant type than are at present in use, assistance was sought of manufacturers of such equipment. They collaborated readily with the committee appointed by the institute, asserted Richard Maize, Secretary of Mines, State of Pennsylvania, Harrisburg, Pa. As a result of a law to become effective May 15, 1946, he added, only trailing cables of fire-resisting material can be used in Pennsylvania mines. All such cables hereafter in all States will have to be flame-resisting, for no manufacturer will find it profitable to make two kinds of trailing cable.

All present makes of cable are about equally combustible but the number of conductors the cable carries and the way in which these are assembled makes some cables more vulnerable to fire than others, declared E. J. Gleim, U. S. Bureau of Mines, chairman of the committee. The temperature of the cable sheath prior to the application of the igniting flame greatly affects the time it will continue to burn after that flame has been removed.

A given cable at room temperature continued to flame for only 9 seconds after the burner flame was removed, but when the temperature of the sheath was raised to 400 deg. F., the cable continued to burn for 4 minutes and 57 seconds after the flame was extinguished. Rate of heating before ignition also is important. A sample heated for 11 minutes until the temperature reached 400 deg. F. burned 12 minutes and 56 seconds after the igniting flame was withdrawn, whereas when 51 minutes was taken to heat the cable to the same temperature, the burning resulting lasted only 13 seconds. Igniting the cable with an electric arc of 100 amp. at 500 volts did not greatly affect the results. The maximum duration of burning after the arc was extinguished was 3 minutes 30 seconds, and the maximum extent of the burned area was 5¼ in. In every case, the cable jackets were of Neoprene and the insulation of Buna S.

Garfield Thomas, Deputy Secretary of Mines for Pennsylvania reported that the limit charge for permissible blasting powders had been raised from 1½ to 3 lb.

Electric Fires Major Issue

Several electric mine fires in the mines of the Pittsburgh Coal Co., 10 of which and perhaps 20, might have proved serious, made it imperative to study the hazard, said A. Lee Barrett, maintenance engineer. Other operating companies were willing to collaborate in that study. Thus, a committee was formed to devise ways of avoiding such disasters. Some method of protecting currents of greater intensity was desirable. It was recognized that large fuses blow after a longer time interval than small fuses, and the ignition thus initiated therefore was more likely to be self-propagating. A 100-amp. fuse may dawdle 1 to 2 minutes before action.

At the afternoon session, the subject of prevention of mine fires resulting from leakages and short circuits was reopened by R. H. Nicholas, director of safety, Pittsburgh Coal Co., Library, Pa., and chairman of the subcommittee on preparation of haulage roads. Straight haulage headings of unvarying width with no more, and no wider, side openings than are necessary are desirable, so that excessive roof areas shall not be left without the support of pillars. Single sightlines in a heading do not seem to guarantee straight headings. Each rib of a heading should have its own sight line.

Undercuts in coal should be made exactly on correct rib line of heading and the sides should be trimmed perpendicularly. Uncontrolled blasting, with improperly placed holes or overcharges irreparably damages roof. Conceding an "extra foot of width to get an extra ton of coal from a cut is the worst kind of economy," because repairs often fail to be made and the roof falls, introducing a fire hazard. The main entries of a mine may have to stand 50 or more years. Because of derailments, legs of sets to support roof, whether of wood or of steel, should rest on the coal rather than on the floor. Study should be made to develop the best form for these legs. Steel roof supports should be effectively grounded. Wood lagging over cross supports should be treated to develop fire resistance. Uniform gradients are desirable as far as they reasonably can be attained. Sharp local humps and dips may cause trips to jam, buckle and derail.

Drains should keep water below level of the underside of ties. Pumps should be arranged to start automatically when water reaches a predetermined level. The waste materials of the average mine are not suited for track ballast.

Plan Track for Future

Without electrified tracks, today's production records could not be attained, declared C. R. Drum, electrical and mechanical engineer, Jones & Laughlin Steel Corp., Vesta and Shannopin Coal Division, California, Pa., chairman, "installation of trolley wires and feeders subcommittee." A haulage layout should not be attempted until the electrical department knows definitely the limits of haulage and mining operations. An overhead distribution system designed for a 400-ton daily capacity would not be adequate for a capacity of 4,000 tons a day.

Limited voltage drop is one of the best insurances against mine fires. The drop should not exceed 20 percent between substation and motor terminals. After establishing the minimum operating voltage for the motors and determining the connected electrical load, the maximum current in the main distribution circuit is multiplied by the "plant factor" of the connected load, usually figured at one-third to one-half the total full-load current.

A negative feeder installed parallel to the track return suspended from the roof or from the rib near the roof and with a copper equivalent of one-half of the rail but not less than 4/0 is recommended. It acts as a "jumper" around a section when rail is being replaced. The difference in gradient between rail and trolley wire should nowhere exceed 2 percent, thus permitting speeds of 30 m.p.h. without damage to trolley wire. The committee recommends that guard boards shall never be supported by the trolley wire.

When tapping feeders, use current taps. Light wires should never be hooked over feeders. Conductors passing through wood or brick stoppings must be protected with insulating tubes secured against movement. If in brick, the tubes should be cemented. Where splicers are inserted in the line, hangers should be installed 2 ft. from each end of splicer, so that, in case of a break, the trolley wire would be prevented from grounding. Substation taps should be in multiple and at each tap location the rails should be cross-bonded. There also should be a cross bond at the ends of all track systems used as negative returns. No headings should be wired beyond the last crosscut. No power circuits should be laid in return airways or in rooms or other working places. Remove all mine wire no longer in use, so that it will not be employed for temporary connections and jumpers. Feeders should be inspected every six months, but trolley wire every three months, as the latter both wears and carries current.

Protect With Breakers

In every instance, mine electric circuits should have sufficient feeder and return-

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The secret of this supple and rugged belt is the Homocord STRENGTH MEMBER. It's a new pattern of longitudinal and cross-cords invented by Manhattan engineers, particularly and only for use in conveyor belts . . . Rippling Muscles of selected cords roll in a resilient matrix of FLEXLASTICS, absorbing and rebounding to every shock . . . And the Flexlastic cover is literally "rubber armorplate."

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circuit capacity that the overcurrent protection will be tripped by a dead "short" even at that circuit's most remote point, said S. M. Cassidy, vice president, Weirton Coal Co., Isabella, Pa., and chairman of the sectionalization subcommittee. An overcurrent circuit breaker should be installed between each pair of sequent substations. This breaker should be installed at such a location that the resistances between each station and the circuit breaker will be approximately equal. If enough copper is used that a ground at any point will trip the circuit breaker at both substations, no intermediate breaker will be required. A sectional insulator, or so-called "dead block," may be used between the substations if parallel operation with other substations is not necessary for satisfactory power service.

For further sectionalizing, a disconnect or circuit breaker should be placed at not over 1,500-ft. intervals in every power line. In addition, an overcurrent circuit breaker should be provided in each circuit where it leaves its substation, either of the manual or the automatic reclosing type. (A trip-free operating mechanism should be used.) Only one circuit breaker will be required at this station, where a substation feeds the main haulage only and only one haulage unit at one time.

An overcurrent circuit breaker should be placed at each main branch circuit. Secondary branch circuits that feed only one local section or territory should be protected by an overcurrent circuit breaker. Circuits to pumps or other fixed loads should have overcurrent protection at their supply ends. Unimportant branch circuits such as serve only infrequently used entries, spur tracks, etc., should have switches for cutting off all power.

Each mining set-up should be protected by an overcurrent circuit breaker, though, in some cases, it may be necessary to protect two set-ups by one overcurrent circuit breaker. All overcurrent circuit-breaker settings should be as low as good operating practice will permit.

When idle territories are not operating, power should be cut off them. Where it is necessary to operate a pump or other equipment in an idle section or an inactive part of a mine, special overload protection shall be provided of such capacity as is needed for its operation.

Provide for Maintenance

Electrical equipment cannot be safe unless, by inspection and maintenance, it is kept in proper condition, said C. R. Nailler, general manager, Hanna Coal Co., St. Clairsville, Ohio, chairman of the subcommittee on "inspection and maintenance," in reporting on the findings of his subcommittee. No system can be effective, he declared, unless there is: (1) correct and simplified installation, (2) a properly organized program and (3) efficient supervision of a well-trained working force. Avoid frills and overcomplicated devices. Too much money is spent and too many accidents result from employing large forces of employees and inspectors in the attempt to continue in operation a poorly made installation.

An instruction sheet should be prepared, should list the defects to be noted, the steps to be taken for their correction, and the minimum frequency at which such inspections should be made. Proper instruments and tools must be provided. They will pay for themselves by the saving of time and the exactitude with which the work is done. Sufficient supplies often will eliminate "patchwork" maintenance that does not maintain. Improper drainage, poor alignment and surfacing, fractured or loose roof, decayed posts, soft coal under hitch holes and badly maintained transportation equipment cause many mine fires. Inspections of track, drainage and roof, trolley wire, feeders, track bonds, hangers, wire clamps, frogs, temperature at connections, clearance from combustibles, tautness, circuit breakers, should be made at least once each week.

Circuit breakers must carry current above their rating or be set above their interrupting capacity. Overvoltage is overloading. **Overload settings should be locked. The** breaker should be "exercised": (1) to note whether it functions; (2) to keep oil distributed in the bearings, and (3) to keep the contact surface free of dust. At least every six months, circuit breakers should be thoroughly inspected and immediately after a severe short circuit. During rock-dusting, breakers should be protected, and after rock-dusting, breakers should be cleaned.

Fighting Mine Fires

Discussing the fighting of fires, J. V. McKenna, Pennsylvania State mine inspector, Waynesburg, Pa., for the subcommittee on fire fighting and recovery, declared that fires get out of control because: (1) the wrong approach is made and (2) the equipment was not used properly or in time, was not available or was not furnished in sufficient quantity. Training of the men cannot be delayed until *after* the fire has occurred. To avoid confusion an organization plan should be made so that all persons will know where to report and what to do when they get there. All orders should originate from a central point. Escape of men is difficult inby a fire if only one split is available.

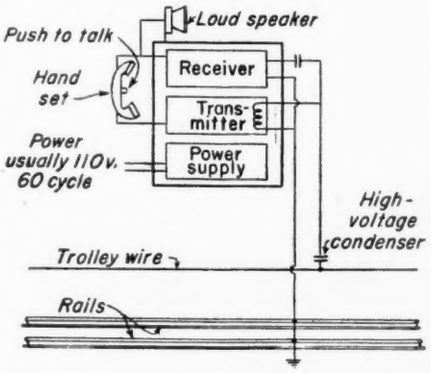
Doors sometimes can be placed and air diverted from the fire area, fresh air then being taken by another entry, thereby providing for the escape of men who otherwise would be trapped. Fires usually occur on **the headings where power lines are located** and coal is being hauled. The fire can be isolated and (1) the men can be taken out in the air that has not passed over or through the fire or (2) its gases can be taken to the return and kept from being carried around the workings. Water lines for fire fighting should be placed along the haulageways. As a man may take an hour to walk from his place to safety, more exits should be provided to the surface, whether through shafts or man-size boreholes.

Organizing for Emergencies

In the 15th inspection district of Pennsylvania an emergency organization has been formed, said D. J. Keenan, mine inspector, Barnesboro, Pa., by all the coal-mining companies and the United Mine Workers of America with the following committees: directional, advisory, engineering, supplies and materials, fans and ventilation, medical, recovery, general emergency, first-aid, food and police. A poster lists the principal companies, their location, persons with whom to get in contact, telephone numbers, numbers of officials available, number of stretchers, flame safety lamps, electric lamps, gas masks, oxygen masks, rescue teams, and cabinets of first-aid equipment on hand. Another poster lists committees and in a general way outlines preparatory procedure. Each committee has enough members to assure that one man at least will be available in any emergency.

Facilitating Communication

Railroads, declared Dr. Paul W. Bossart, research engineer, Union Switch & Signal Co., have installed means by which communication can be established: (1) between one end of a train and the other, (2) between two trains, or (3) between a train and a wayside station. In a study reported by the American Association of Railroads, it was shown that, at Columbus (Ohio) *B* yard of the Pennsylvania R.R. savings were made nearly 3½ times as large as the investment involved in this means of communication. Frequency modulation (FM) has much improved the operation of such systems.



Inductive method of transferring speech.

Trains use: (1) the inductive-carrier system, which consists of a conductor paralleling the track, by which the current is transmitted. The carrier has no direct connection with the train, so the movement of the latter is unrestricted; (2) the space-radio system, under which waves are broadcast through the open air in all directions. The first system can be operated without the necessity of obtaining the assignment of a definite frequency from the Federal Communications Commission. Furthermore, its personnel does not have to obtain a government license. In talking between a wayside station and a train, the inductive-carrier range usually is 25 to 75 miles, and the space radio range is 4 to 12 miles.

Carrier currents operate at frequencies 100 times as high as that of the voice but only about a tenth as high as those used in ordinary broadcasting and only about a thousandth as high as those the government has set for exclusive railroad space-radio use, being about 40,000 to 250,000 cycles per second, but frequencies of inductive-carrier systems are high enough that noises of most electrical machinery will not interfere with reception and low enough that the noise will

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The Cantrell Type "SP" Compressor is a complete, independently operated, combination air compressor and two-ton locomotive. It takes you to the job, completes its work, brings you back again—all under its own power. It's on its own at all times—no time wasting or waiting to get to point of service . . . no holding up of other work of heavy locomotive and crew for transporting compressor.

Truly, no wide-awake mine is fully equipped without a Cantrell Type "SP" compressor. Its cost is a small item compared with the savings made through its use.

In addition to regular drilling work, you use the Cantrell "SP" for ditch lining, leveling haulways, hauling repairs, shifting pumps and mining machines, chipping, riveting, blowing substations . . . a new, broader service in a complete air compressor.

Imperial Cantrell builds 5 types of compressors to meet every requirement of track or trackless coal mining. One of them will fit your needs and at most reasonable costs too. Write or wire us now for complete information.

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not leave the right of way and will not broadcast as does space radio.

Railroad space radio uses about 165,000,000 cycles per second, but practically all space-radio tests failed in tunnels, whereas inductive-carrier radio made it easy for a coal-mine trip dispatcher to talk to any mine motorman within a radius of about 5 miles. If the carrier apparatus is set in the center of the area served, it will cover a 10-mile stretch. The office of the dispatcher can be placed anywhere if an ordinary telephone circuit is provided to carry the sound to the carrier apparatus. Repeating equipment should be installed if greater distances need to be traversed.

On the surface, the inductive-carrier system may transmit 65 miles, but underground the same effect will be obtained only when the distance does not exceed 5 miles, (1) because the wire is much nearer the ground and thus more of the current drains away, and (2) because the insulators leak more, so that the current diverges along many branching paths. Moreover, in this case more electric machinery per mile will be connected to the trolley, which thus increases the electrical interference and drains off signal current. But the range is still ample for practical use.

With trolley haulage, the trolley wire can be used as inductive carrier by insulating the set from trolley voltage by a high-voltage condenser, which will allow the talking currents to flow; but, if there is no trolley wire, a telephone wire stretched along the rib will serve. Each communication set has a loud speaker and an ordinary telephone hand set, with a button that is pressed when talking and released when listening. Usually, a button or lever is used to send an attention signal tone or whistle with a further code signal for indicating which motorman is being called. Tests have been made with the inductive-carrier system at the Montour No. 10 mine, of the Pittsburgh Coal Co.

Three Telephony Systems

Two magnetic or sound-powered types of telephones that require neither batteries nor an external source of power have been approved by the U. S. Burau of Mines for use in methanous mines, asserted Mr. Gleim. An installation of wired radio underground also has been studied. However, these types have not been "generally accepted" for underground work because of the war and other factors. So the conventional mine telephones are being used still in coal mines even though (1) some makeshift arrangement of lamp bulbs or resistors connected to the trolley circuit generally has to be used to keep them dry, and though (2) telephones and telephone circuits frequently are so damaged by fires and explosions that they cannot be used just when they would be almost invaluable.

Greater reliability, latitude and flexibility than the usual telephone system can afford are desirable. Some apparatus is needed that fires and explosions would not put out of use.

One of the equipments approved is a telephone of the sound-powered battery-less type with a magnetic ringer and a selector switch for selecting the stations to be called. The other is a public-address system with microphone and radio amplifiers, forming a central station in the superintendent's office above ground. Any number of loud speakers up to 15 per line can be located at the most effective points underground and connected with the system by a metallic armored or sheathed cable that can be buried for protection against all manner of violence. Results of this investigation were published in 1929 as Technical Publications No. 433.

What Can Be Done With Inductive-Carrier Equipment

Dispatcher can spot all locomotives.

Dispatcher can revise orders instantly.

May squeeze in another trip per shift.

Can report roof and trolley-wire falls, derailments and equipment damage.

Can report big falls, explosions and fires even when power is turned off.

Can converse full mile over mine rails.

Ribs Support Conductors

The Pittsburgh Coal Co. has installed a two-wire non-grounded magneto bridging system for its telephones in which all the ringers are connected directly across the two conductors at all times, said A. B. Cunningham, assistant electrical engineer, Library, Pa. In some cases the wires were buried in the ground but now some mines are supporting them on the rib. Roof falls may trouble them there, but there is no longer any trouble from road cleaners sinking picks into them, after which mishap acid water soon makes the lines noisy.

At Montour No. 4 main shaft an audio amplifier system with a weatherproof IB-8 Bogen speaker has been installed at the shaft bottom, connected by a single two-conductor cable to a Bogen E 10, 10-watt amplifier and a second IB-8 speaker at the hoisting engineer's platform.

The cager can talk when 15 ft. from the "speaker" and can hear 50 ft. away. Of course, when the "speakers" are used as microphones they must be coupled to the input through a 100,000-ohm transformer. This equipment is duplicated to enable the hoisting engineer to communicate with the top cager. Maintenance of this equipment has not been costly. In this shaft, no men are hoisted.

Trucks Facilitate Timbering

In all production sections of the Willow Grove mine of the Hanna Coal Co., working the No. 8 seam, two 16-ft. 60-lb. steel cross-booms have to be set after every room cut, explained F. R. Zacher, Hanna production engineer, St. Clairsville, Ohio. The rooms are 22 ft. wide. Four posts have to be set under each steel boom and six additional posts under the roof. Thus, for each 9-ft. cut, two cross-booms and 16 posts are needed. To place these, three men, equipped with a 4-wheel push truck and a lifting jack, load two stock booms on the truck at a storage point, push the truck to the neck of the room needing support, load the truck with 16 posts, caps and wedges, push the truck to the face and set the timbers by hand, using a hand saw to trim the posts. About one in every eight places must be lagged over the boom and over other posts, and also in other places where roof falls have occurred. Sixty percent more time is spent in placing supports for the roof in this manner than is expended on cutting or loading, yet the present performance of these two functions is at best only 50 percent efficient.

Over-all dimensions of the experimental timbering truck are: length, 15 ft.; width, 7 ft.; deck height, 27 in. above rail. The equipment comprises a hydraulically operated boom-type lifting jack, a power-driven cut-off saw built into the inby end and an operative's cab at the rear end. The truck is self-propelled, has four roller-bearing wheels of 18-in. diameter, weighs 8,000 lb. light weight, and can switch two loaded 10-ton mine cars. Material-carrying area of the deck is 76 sq.ft. Ten booms and 30 posts can be carried with ease. Addition of a flat 8-wheel truck that will carry 200 posts is contemplated. This will be coupled directly to the timber truck. This should save having to load posts for every other room. Two good men using the truck can accomplish in 37 minutes what three men formerly did in 80 minutes, a saving of almost 50 percent in man-hours.

Water for Preparation

Quoting C. W. H. Holmes, of Great Britain, D. H. Davis, product-control manager, Pittsburgh Coal Co., Library, Pa., said: "Few things in the preparation of coal are so widely used, so soundly cursed and so little understood as the water we use in our washeries." For making the separation, the wet-cleaning plant usually requires twice to six times as much waste water as coal by weight, depending on the type of cleaning plant used. No wash water with more than 3 percent solids will serve for fine-coal cleaning and it should have less than 5 to 20 or 30 percent when cleaning coarse coal. Because of the presence of clay, it has been found uneconomical to install the necessary equipment "to close the circuit." Consequently, many wet fine-coal (under-$\frac{3}{8}$ in.) cleaning plants waste the minus 28-mesh, or minus 1-mm., material, which usually represents 4 to 5 percent of the mine-run.

Means of conforming to laws prohibiting stream pollution are four: (1) Installation of proper thickening, clarification, dewatering and drying equipment to produce a closed or nearly closed circuit; (2) dedusting ahead of cleaning plus a smaller expenditure in equipment named in (1); (3) construction of impounding dams; (4) employment of means of burning fine solids at the mine or plant, but in this case thickeners and probably filters still will be required. During the fuel shortage, consequent on the war, wet filter cake containing 25 percent of moisture was used widely at mine power

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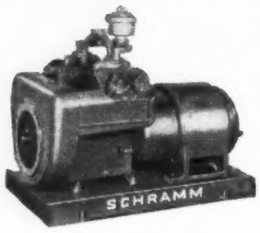

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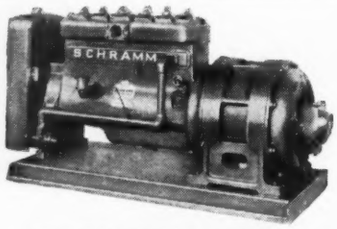
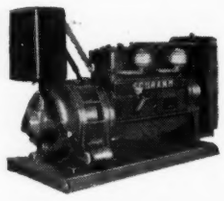


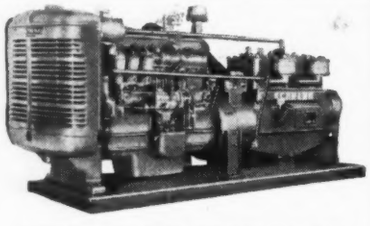
DIRECT MOTOR DRIVE WITH COOLING UNIT

Schramm 300 cu. ft. displacement with direct-connected 50 H.P. motor with cooling unit on Steel Deck Base.



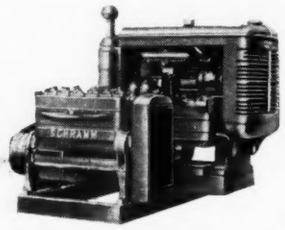
DIRECT DRIVE WITH STARTER AND RADIATOR

Both compressor and motor are mounted as a single unit on a substantial steel base with starter, radiator, and cooling unit.



DIESEL ENGINE DRIVE-IN LINE

Complete self-aligned, direct connected Diesel Engine Driven Compressor for semi-portable or stationary installation.



BELT DRIVE ON BASE WITH ENGINE

Schramm Engine Belt Drive on Base combinations are available for applications not reached by electric power service in mill, mine, and other industrial plants.

SCHRAMM INC. COMPRESSOR SPECIALISTS WEST CHESTER PENNSYLVANIA

plants. Burning equipment was developed to handle this product.

For continental Europe, wet slurry (not filter cake) was fed down a practically vertical chute to a furnace, where a feeder allowed the coal to discharge slowly onto a grate below, forming a thick bed where the slurry was coked. In transit through the lower part of the chute the slurry was dried, ready for this coking. The coke made was consumed on the grates.

Settling Advocated

Stream pollution can be prevented by installing sludge tanks using a closed system, declared F. B. Dunbar, general superintendent, Mather Collieries, Mather, Pa. From time to time, the sludge tank must be drained into a settling basin, the water filtering through the basin and the solids remaining. When this basin has to be cleaned, the fine coal can be picked up by a clamshell or moved by a bulldozer and mixed with other coal or can be used in foundries as sea coal. The settling basin should be large enough that it will not have to be cleaned more than once a month or, better yet, once every three months. It should be located near a refuse dump where the water will filter through to a stream, or if this cannot be done, to a secondary basin and from thence to the creek.

The simplest means of recovering sludge is by use of a settling pond, asserted J. M. VonFeld, preparation manager, Consolidation Coal Co., Oakmont, Pa. This may be a concrete-lined tank or merely an excavation with the soil forming the sides, or the sludge may be pumped to old strip pits for impounding. When the pond becomes full, another is made, or the sides of the original pond are raised to a higher level. Where two are used, one can be emptied while the other is used for settling.

Clay and Fines Inseparable

In most cases, declared M. O. Evans, chief engineer, Northern Coal Mines, Republic Steel Corp., it is almost impossible to separate clay from coal and the $\frac{1}{8}$ x 0-in. coal has to be pumped into abandoned parts of the mine or into a natural basin, where it is

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 *Colliery Engineer*, with which *Mines and Minerals* previously had been consolidated, was absorbed by COAL AGE.

When, in 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During 34 years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody, Sydney A. Hale and Ivan A. Given. The editorial staff of COAL AGE consists of Ivan A. Given, R. Dawson Hall, Louis C. McCarthy, J. H. Edwards, Charles H. Lambur and Ralph R. Richart.

Your money keeps on coming back!...

There's something you can count on when you buy a new Mack truck . . .

It's a very simple thing. And a very fundamental principle of good business operation . . .

When you put the right Mack truck on your job, you know that it will pay you back in extra work on that job long after its purchase price has been earned.

That's what Macks are built to do

It's why Macks are built with such lavish use of heat-treated hardened steel—with wristpins finished to 2 ten-thousandths of an inch—with case-hardened, generator-ground timing gears so tough none has *ever* had to be replaced because of wear . . .

Things like these are why Macks *last* so long. Why they stay *on* the job and *out* of the repair shop. Why Macks make money *on* the job for men who pick them *for* the job...

New Macks are now being built again for civilian use . . . why not get after yours now?

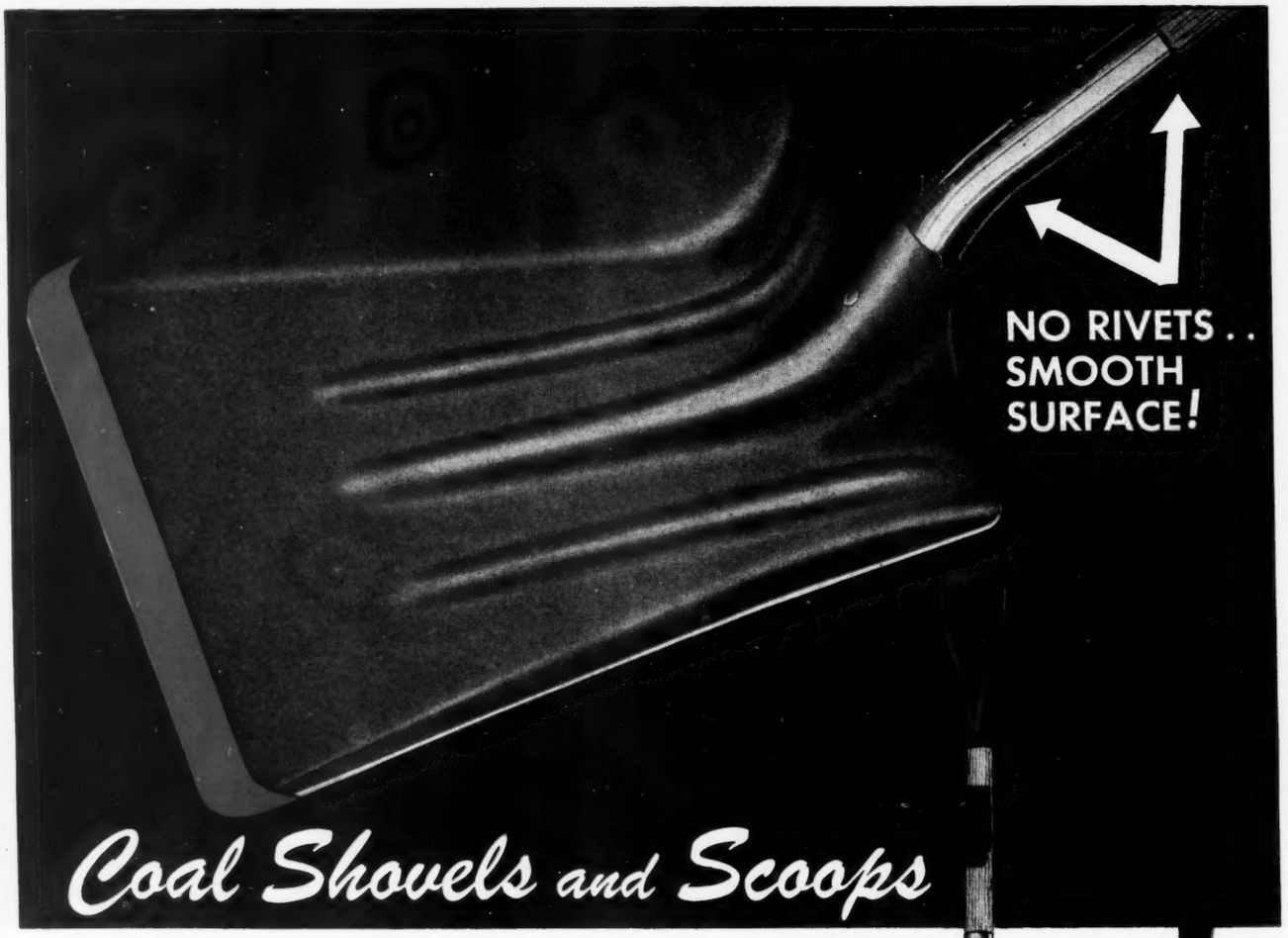
Mack Trucks, Inc., Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N.Y. Factory branches and dealers in all principal cities for service and parts.

Mack
TRUCKS
FOR EVERY PURPOSE

Performance Counts!

Wyoming RED EDGE

RIVETLESS SOCKET FEATHERWEIGHT



Coal Shovels and Scoops

BALANCE AND WEIGHT

Red Edge Featherweight coal shovels and scoops with their rivetless, smooth surface socket and alloy steel blades, are light in weight, unequaled in toughness and famous for their ability to resist abrasive wear.

For Bituminus Coal specify Red Edge Coal Shovels and for Anthracite Coal, Red Edge Coal Scoops.

ARMY E NAVY

AMES PRODUCTS
SHOVELS
SPADES
SCOOPS
FORKS
RAKES
HOES
Post Hole Diggers

AMES Since 1774

AMES BALDWIN WYOMING CO.

PARKERSBURG, W. VA. NORTH EASTON, MASS.

deposited so that the water will return to the stream with little or no solids.

At a mine where coal is washed in a sand-and-water medium, the 3 x ¼-in. is scalped out and washed, and the ¼ x 0-in. is bypassed into the railroad car without further cleaning. As the mine-run has a large percentage of water, much fine coal passes into the cone. After the coal is washed, it is discharged onto a desanding and dewatering screen, where the sand and sludge are washed out of the stream of coal and discharged by gravity into a sand sump. The sludge passes through the drain pipes located in the bottom of the sump and enters a well, where it is pumped into a large cone-shaped vessel and allowed to settle to the bottom, and the settled sludge is then pumped to a filter, where it is dewatered. The average moisture of this product is 22 percent. It is mixed with clean coal and used for coking.

At another mine, 18 percent of the 3½ x 0-in. clean coal is ⅛ x 0-in. and of this 10 percent is 1/16 x 0-in. The ⅛ x 0-in. sludge and jig water, about 5,000 g.p.m., is discharged into a tank 100 ft. long, 15 ft. wide and 10 ft. high with vertical baffles installed to retard the flow of water and thus produce sedimentation. The lower ends of the baffles are about 18 in. from the tank bottom. At the rear end of the tank is an adjustable outlet to a sluice that discharges about 1,000 g.p.m. of the thickened water into a 75-ft.-diameter thickener. This water contains 30 percent solids by weight ranging in size from 10- to 200-mesh. This sludge is conveyed to a well at the center of the thickener, where it is collected and discharged by pipes to filters, dewatered and conveyed to the clean-coal conveyor. The filter cake contains 22 percent moisture.

C.M.I.A. Officers for 1946

President—G. W. Grove, U. S. Bureau of Mines, Pittsburgh, Pa.

Vice Presidents—C. A. McDowell, director of industrial labor relations, Jones & Laughlin Steel Corp., California, Pa.; C. M. Donahue, mining sales division, Mine Safety Appliances Co., Pittsburgh, Pa.; J. L. Hamilton, assistant manager of mines, Republic Steel Corp. Uniontown, Pa.

Secretary-Treasurer—J. A. Younkins, assistant general superintendent, Duquesne Light Co., Pittsburgh, Pa.

Managing Directors—J. M. Connor, general superintendent, Allegheny Pittsburgh Coal Co., Pittsburgh, Pa.; J. V. McKenna, State mine inspector, Waynesburg, Pa.; W. P. Vance, general superintendent, Butler Consolidated Coal Co., Wildwood, Pa.; E. A. Siemon, division superintendent, Hillman Coal & Coke Co., California, Pa.; H. P. Greenwald, superintendent, Central Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa., and D. J. Keenan, State mine inspector, Barnesboro, Pa., appointed to succeed J. L. Hamilton, now a vice president.

This McCarthy machine eliminates the guesswork and hard work from horizontal drilling. Hydraulic feed plus fingertip control results in at least 40% more holes drilled per day as proved by actual operations. New type jack raises machine as much as 4' from truck bed. Compact, rugged, and heavy (3500 pounds), the McCarthy will handle 7' augers readily. Easily moved from job to job.

SEE THE McCARTHY BEFORE YOU BUY

In writing, be specific as to what you are drilling, depth, etc., so we can give you factual data.

PHONE — WIRE — WRITE

SALEM TOOL CO. SALEM, OHIO

Drilling and earth boring specialists. Manufacture all types of augers from 1¼" to 8" Dia. and distribute complete line of mining tools and supplies.

STOP UNLOADING WORRIES

Freezeproof your coal with WYANDOTTE CALCIUM CHLORIDE

Unloading coal *is* a worry when it's frozen in the car. Time and labor are wasted in cracking it. Railway cars are kept idle. Dealers can't meet delivery schedules.

You can easily save your dealers this expense and inconvenience. Freezeproof your coal with Wyandotte Calcium Chloride.

Coal treated with Wyandotte Calcium Chloride is readily handled at the yard—even in sub-zero weather. It comes out of the car the same grade as it went in—not battered, smashed or cracked. And no special equipment is needed to handle Wyandotte Calcium Chloride for freezeproofing.

The coupon will bring you full information about this safe, dependable and economical agent for treating coal.

WYANDOTTE CHEMICALS CORPORATION
Michigan Alkali Division
Wyandotte, Michigan

Send me literature and further information about the uses and advantages of Wyandotte Calcium Chloride.

*Name*_____

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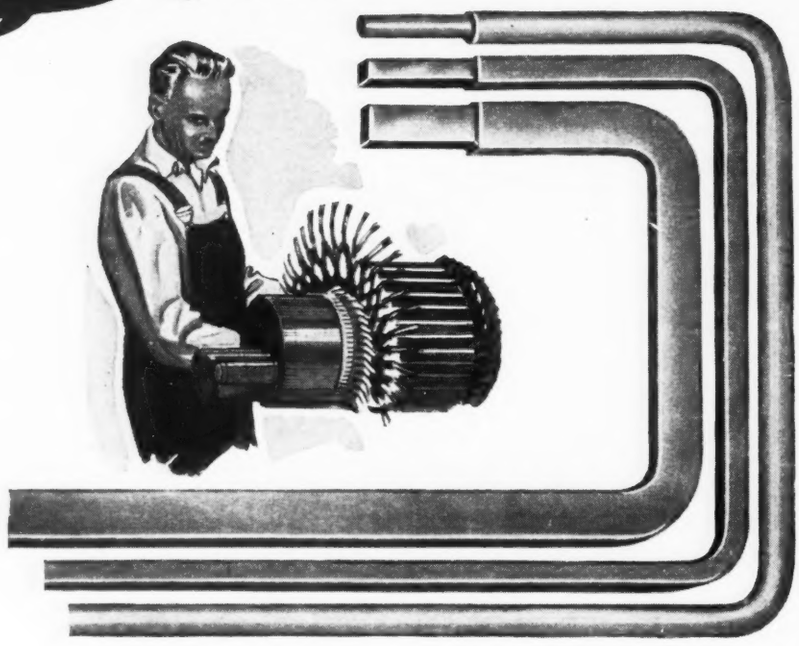
Wyandotte REG. U. S. PAT. OFF. **CALCIUM CHLORIDE**

WYANDOTTE CHEMICALS CORPORATION
MICHIGAN ALKALI DIVISION, Wyandotte, Michigan

REWIRE OVERWORKED MINE MOTORS WITH

Deltabeston



The selection of the proper magnet wire is very important today because motors in mines operate at peak load with little time to cool off. As a result the overworked motors build up intense heat, wiring insulation bakes out, and mining equipment must be repaired more frequently.

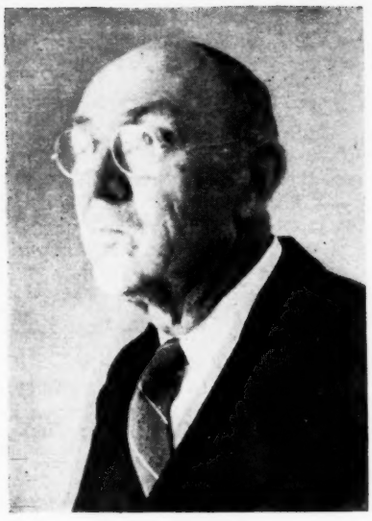
Next time rewire mine motors with Deltabeston Asbestos-insulated Magnet Wires and see the difference. Motors will stay on the job longer despite overloaded conditions. Unexpected repairs will be reduced to a minimum because Deltabeston is constructed to withstand the tough operating conditions encountered in the mines. If you use ready-made coils with class B insulation, specify Deltabeston-wound coils.

Deltabeston Magnet Wire is insulated with purified felted asbestos, impregnated with a varnish compound to resist high heat, great moisture and other destructive agents. And Deltabeston is extremely flexible. Its soft copper conductors can be formed into the most intricate shapes without rupturing the insulation. Deltabeston is available in round, square and rectangular shapes in a complete range of sizes.

Do you have a rewiring job that requires a superior magnet wire? You can obtain additional information by writing to Section Y-161-10, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn. All Deltabeston Asbestos-, Glass- and Synthetic Wires are distributed nationally by Graybar Electric Co., G-E Supply Corp., and other G-E Merchandise Distributors.

KEEP ON BUYING BONDS—AND KEEP ALL YOU BUY

GENERAL ELECTRIC



Fred W. Richart

Fred Richart Retires

After 4½ years of wartime service, Fred W. Richart, Carterville, Ill., has retired from *Coal Age* at his own request. He will continue, however, to handle occasional assignments of a special nature in the Middle West from time to time.

After earlier retirement from the sales and engineering staff of the General Electric Co., Mr. Richart served *Coal Age* on an assignment basis for several years, before joining the staff Aug. 1, 1941, as a full-time assistant editor. Since that time, he has specialized in keeping *Coal Age* readers abreast of developments in the coal fields of the Middle West and has contributed several outstanding special studies of mining problems. One was a series on modern stripping equipment and methods. Another was practical maintenance of coal-preparation plants and equipment. Terminating his regular connection with *Coal Age* as of Dec. 31, 1945, Mr. Richart plans to devote his time primarily to private affairs, including the preparation of material on historical and human-interest happenings in southern Illinois.

•

Can Plant Strip Land At a Profit

A spreading program to reclaim strip-mined land was outlined Dec. 11 by L. E. Sawyer, director of forestry and land reclamation for the Indiana Coal Producers' Association. Speaking at the McCurdy Hotel, Evansville, Ind., his talk largely concerned the Wyandotte area, in southwestern Indiana, where 24,066 acres has been strip-mined.

Mr. Sawyer, who for two years has been examining stripped land for the Indiana association, says he has found that such land can be planted at a profit, besides having high recreational value. He said that before determining what should be done with such land it is the policy of the association to determine for what it is best adapted. Land suitable for forage crops, he said, is planted for pasture, and if unsuitable is reforested.

"CATERPILLAR" DIESEL

. . . TRACTOR-OF-ALL-TRADES

The jobs a "Caterpillar" Diesel Tractor can do—and do more efficiently, at lower cost—on a coal-mine operation, are almost numberless.

At Mackie-Clemens Coal Company's No. 23 Mine, Pittsburg, Kansas, eight "Caterpillar" Diesel Tractors are kept busy all day and every day. They level ahead of the dragline—dig ditches—move equipment—feed shovels—build truck roads—work on the spoil banks. Conditions are often bad, with mud that would stall machines of less power and traction.

The owners say, "We've tried everything, and as far as tractors go, 'Caterpillar' Diesels are standard with us."

Built to handle the tough jobs, "Caterpillar" Diesel Tractors have the rugged design, quality materials and thorough workmanship that produce more work with less down time. Exceptional fuel economy and low maintenance pay off in dollars. And the long life of "Caterpillar" Diesels—some have run up records of 50,000 hours and more—makes them unbeatable on a cost basis.

Your "Caterpillar" dealer backs the equipment he sells with the finest parts and service set-up in the business. It will pay you to talk to him about your earthmoving needs.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR DIESEL

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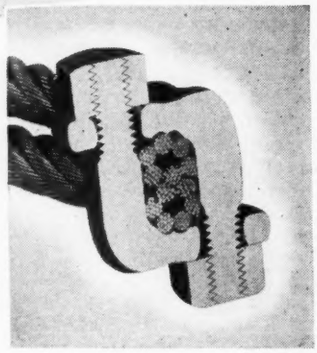
ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

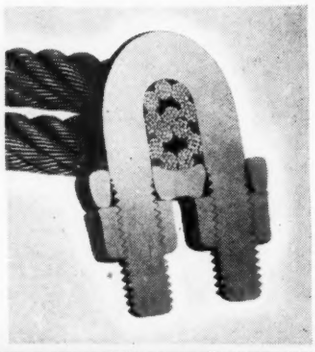
A "Caterpillar" Diesel D6 Tractor, equipped with LaPlant-Choate 'dozer, pushes coal up to the dragline at Mackie-Clemens No. 23 Mine.

TREAT YOUR PREFORMED WIRE *Right*

RIGHT AND WRONG WAY TO HOLD WIRE ROPE

Examine these cross-section views of a "Fist-Grip" Safety Clip and "Finger-Pinch" U-bolt. (Each tightened to exactly the same tension with a torque-indicating wrench). Notice how the "Fist-Grip" clip holds the rope evenly with only the slightest flattening . . . how the U-bolt crushes the rope out of shape as evidenced by the distorted hemp center under the "U".



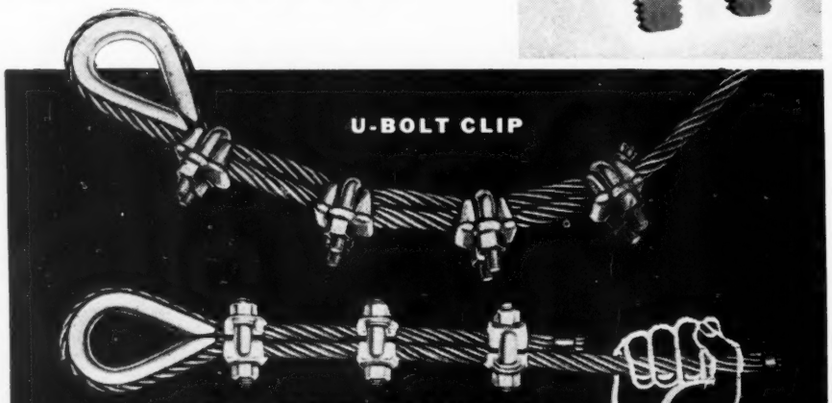


"PREFORMED" ROPE DESERVES "FIST-GRIP" CARE

When you pay extra for the advantages of "Preformed" rope, protect your investment by using Laughlin Safety Clips that keep ropes straight and strong. Get these other features too . . . the only clips with drop-forged bolts — 3 do the work of 4 U-bolts — they can't be put on backwards.

If you haven't tried "Fist-Grip" Clips . . . purchase a few to test. See how much faster they can be installed . . . how much better they work . . . how much you save in clips, time and money.

Distributed through mill, mine and oil field supply houses. Send for Laughlin's catalog of wire rope and chain hardware. Address Dept. 6, The Thomas Laughlin Co., Portland 6, Maine.



LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS

Coal Stripping Planned in Washington

Several sections of land have been leased near Bucoda, Thurston County, Wash., by a newly organized mining group for strip mining operations, it was disclosed Dec. 1. The operation is expected to produce from 500 to 1,000 tons daily, it was said by W. G. Framm, Portland, head of the Penn-Bucoda Mining Co., the lessee. Superintendent of the new operation is J. MacAfee, Bucoda.

Stripping of the overburden, mostly clay, is under way. The cover, according to the operators, is about 30 ft. thick, and under it are four coal seams, the upper one 14 ft. thick. The three lower beds are respectively 5, 7½ and 8 ft. thick.

•

Kentucky May Have Coal Severance Tax

Working on a tax program to be introduced in the Kentucky Legislature in January, Governor Willis' pre-General Assembly Commission has suggested the old coal-production tax, under the definition of a coal severance tax, at 5c a ton to raise $2,500,000 of additional revenue. Also it was proposed to increase ad valorem rates on real estate, which would hit owners of coal mines and other property owners for another $2,500,000.

Observers point out that a large percentage of Kentucky-produced coal moves out of the State, to buyers who can buy coal from competing fields that do not have to pay any production tax, besides stressing the disadvantage to Kentucky operators in freight rates to normal markets, which forces them to absorb much of the freight to be able to compete.

•

Personal Notes

O. W. Brown, general mine foreman for the DeBardeleben Coal Corp., with which he has been connected for 21 years, has been promoted to assistant superintendent of the Hull mine, Hull, Ala.

Walter Lockhart, mine foreman of No. 3 Empire mine of the DeBardeleben Coal Corp., Empire, Walker County, Ala., which he has served for 19 years, has been promoted to assistant mine superintendent at Corona No. 20 mine, Corona, Ala.

C. J. Franklin, who has served 22 years with the DeBardeleben Coal Corp., has been appointed superintendent at the central preparation plant, Empire, Ala.

J. Monroe Sandlin, 20 years with the DeBardeleben Coal Corp., has been appointed assistant superintendent at the central preparation plant, Empire, Ala.

W. L. Meyers, mine foreman at Sipsey mine of the DeBardeleben Coal Corp., with which he has been employed for 15 years, has been promoted to mine superintendent at that operation, Sipsey, Ala.

Oscar Wallace, mine foreman at Hull

OPPORTUNITY FOR MINE CAR DESIGNERS TO LENGTHEN SERVICE LIFE

That's one big reason why these low alloy, high tensile steels were developed — to help designers of mine equipment to increase car life in punishing service without any step-up in car deadweight.

And here is how it's done.

Republic High Strength Steels provide a minimum yield point of 50,000 pounds per square inch—are equal in abrasive resistance to carbon steels of like physical properties — resist atmospheric corrosion.

In mine cars this means greater strength, toughness and durability to resist rough usage. It means that cars stay out of repair shops years longer. It means savings in maintenance and replacement expense. And, where no more payload is desired, you can design cars of lighter weight without any reduction in life expectancy.

So that designers and builders may realize greatest benefits, Republic produces three high strength steels —Republic ALDECOR, Republic COR-TEN and Republic DOUBLE STRENGTH in bars, plates, sheets, and strip. Although similar in physical properties, certain differences in forming and welding characteristics may make one more suitable for you than the other two.

Republic's metallurgical staff is ready now to work with you in determining how best to apply these steels to your equipment. Write us.

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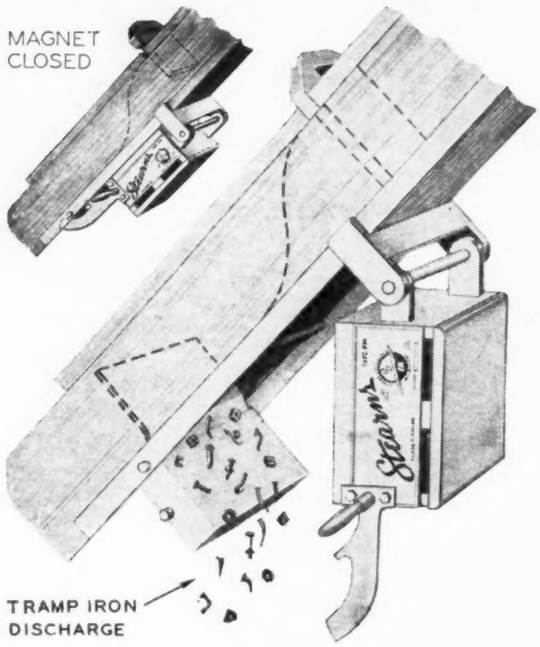
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Bldg., New York 17, N. Y.

Republic
HIGH STRENGTH STEELS
ALDECOR • COR-TEN • DOUBLE STRENGTH

Other Republic Products include Carbon, Alloy and Stainless Steels — Sheets — Plates — Pipe — Bars — Wire — Bolts, Nuts and Rivets



Stearns PERMANENT
MAGNET Spout Separator

REASONS WHY
YOU SHOULD
MAKE IT A
STEARNS

Fully automatic in operation.
No manual removal
of tramp iron.
Tramp iron is automatically
discharged.
Double gap provides two
magnets in one unit.
The separator with a trap gate.
Has Mill Mutual
Class "A" rating.
Held in operating position by
magnetic attraction.
Positive action of trap gate,
open or closed.
No electrical current needed,
furnished complete and can be
installed by anyone.
Backed by two generations of ex-
perience, your guarantee of
satisfaction.

Stearns
STEARNS-MAGNETIC MILWAUKEE

MAGNETIC MFG. CO.
PULLEYS—DRUMS—ROLLS
CLUTCHES—BRAKES—MAGNETS
661 So. 28th Street, Milwaukee 4, Wis.

mine of the DeBardeleben Coal Corp., Hull, Ala., with which he has been associated for 17 years, has been promoted to assistant mine superintendent at Empire No. 3 mine, Empire, Ala.

M. F. Aycox, transitman with the DeBardeleben Coal Corp., Sipsey, Ala., and 12 years with the company, has been promoted to assistant to the chief engineer, in charge of engineering, leased mines.

Thomas Murphy has been appointed manager of coal operations, Northwestern Improvement Co., with headquarters in Roslyn, Wash., vice D. R. Swen, who has been retired under the company's pension rules after more than 45 years' service with the Northwestern and the Northern Pacific Railway Co.

C. C. Youell, formerly superintendent of Leatherwood mine of the Blue Diamond Coal Co., near Hazard, Ky., has been appointed superintendent of Mines Nos. 3, 52 and 53 of the Clinchfield Coal Corp., in Russell County, Virginia.

William F. Hahman has been appointed Assistant Deputy Solid Fuels Administrator for War to handle distribution and transportation problems pertaining to solid fuels. Serving since the organization of SFAW in 1943 as chief of the Bituminous Distribution Division, he replaces Clark M. Groninger, who resigned Nov. 23 to return to his old job as coal traffic manager, Baltimore & Ohio R.R. After serving with a number of companies as mining engineer, authority on explosives or mine executive, Mr. Hahman entered the government service in 1938 as associate price examiner of the Bituminous Coal Division.

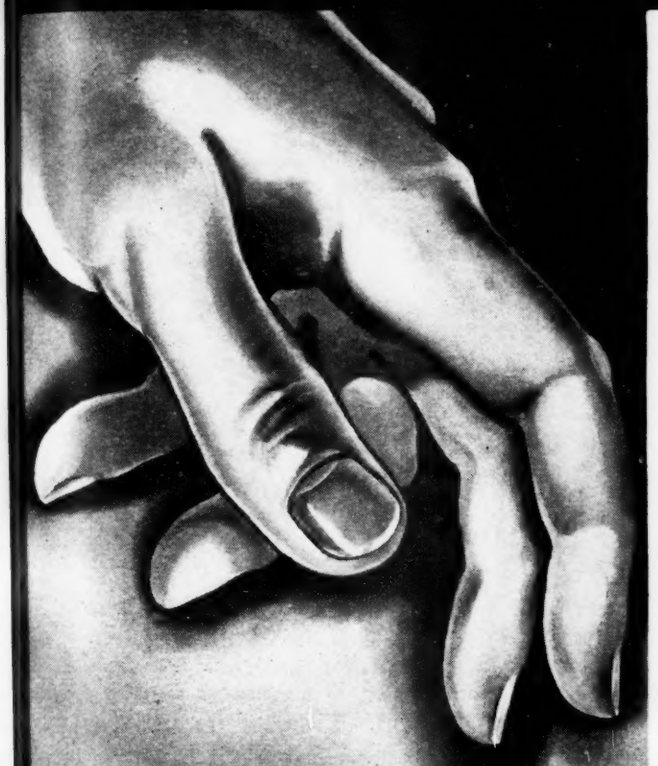
William G. Caperton has been appointed chief of the Bituminous Distribution Division, SFAW, vice William F. Hahman. Entering the coal business in 1914 with the New River Co., he became vice president in charge of sales in 1928. He left the company in 1937 to become president of the Smokeless Coal Corp., joining the SFAW staff in 1943.

James Dixon, superintendent at Pine Ridge colliery, Hudson Coal Co., Wilkes-Barre, Pa., has been transferred to the Scranton office as special engineer, reporting to E. C. Weichel, assistant general manager—operations. Mr. Dixon started with the predecessor company in 1889 as a slate picker and has worked in many jobs for the company since, becoming superintendent at Clinton colliery in 1925 and being transferred to Pine Ridge two years later.

Elmer Williams, superintendent of Delaware colliery, Hudson Coal Co., Hudson, Pa., for the last year, has been appointed colliery superintendent of both Pine Ridge and Delaware operations. Joining the company in 1919, he has worked successively as miner, company man and sectional foreman; then ventilation inspector over all the company's collieries, and eventually succeeded P. J. O'Hara as superintendent of Delaware colliery.

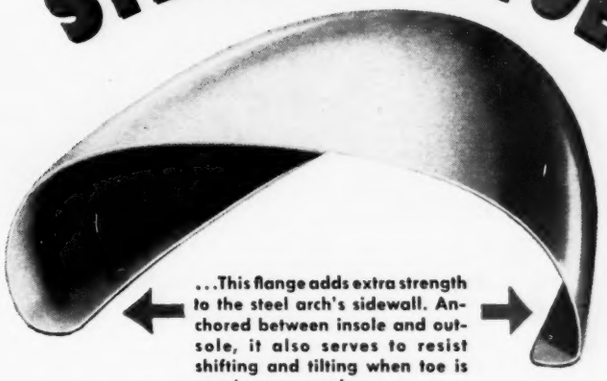
Gerald Blake, assistant on machine mining for the Hudson Coal Co., which he joined in 1925, has been appointed assistant

Don't leave it to chance

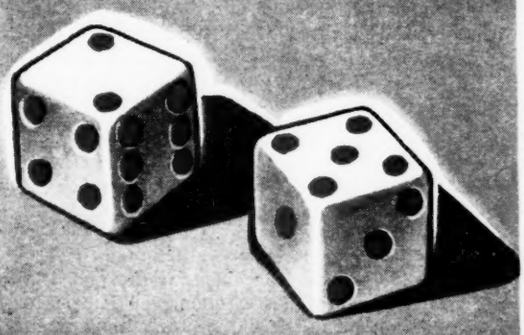


LEAVE IT TO— HY-TEST

THE SAFETY SHOE WITH THE ANCHOR FLANGE STEEL BOX TOE



...This flange adds extra strength to the steel arch's sidewall. Anchored between insole and outsole, it also serves to resist shifting and tilting when toe is struck at an angle.



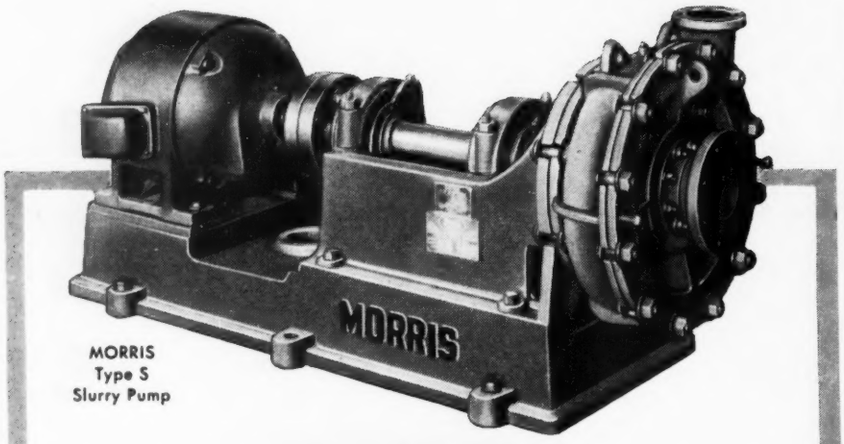
IN DICE—the odds are 6 to one against rolling a seven; 9 to 1 against five or nine; 7.2 to 1 against six or eight; 12 to 1 against 4 or 10; and 36 to 1 against 12 or 2.

You cut down the accident odds when you provide your workers the added protection of Hy-Test Safety Shoes. For the Anchor-Flange Steel Box Toe in every Hy-Test shoe is scientifically designed to stand up under greater pressure . . . harder impact. The arc of steel, anchored between insole and outsole by the strong rounded flange, has saved the toes of hundreds of workers. This unique box toe safety feature is but one of the extra values in Hy-Test. Sturdy quality leathers and skillful crafting by the world's largest shoe manufacturer are other advantages that have helped make Hy-Test the world's largest-selling safety shoe. Write us now. The Hy-Test representative in your territory will tell you more about Hy-Test Safety Shoes and about Hy-Test's special servicing plan for workers in your plant.

THE WORLD'S LARGEST SELLING SAFETY SHOE

HY-TEST *Safety Shoes*

HY-TEST DIVISION • INTERNATIONAL SHOE COMPANY • ST. LOUIS 3, MO.
EASTERN OFFICE • MANCHESTER, N. H.



MORRIS
Type S
Slurry Pump

You Need **STAMINA** in a Pump

For a JOB Like This...

● Clear-water pumps are inadequate when it comes to moving material to slush-basins. That's a job for Morris Type "S" Slurry Pumps—pumps that are especially engineered to handle heavy silt, discharging it through long pipe lines, and against high heads. Year-in, year-out, these "engineered to the job" pumps turn in a better performance record, handling consistently higher volumes over a longer period with less maintenance and lay ups.

Interchangeable wearing parts of Morris Flintmetal "S" resist abrasion and acid corrosion and endure long in service. The Morris patented pressure-balanced impeller minimizes re-circulation, induces smoother flow and increases pumping efficiency.

●

There's 81 years of pump engineering behind every Morris Pump. Write for Bulletin 173, or outline your requirements.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS **CENTRIFUGAL PUMPS**

superintendent of Pine Ridge and Delaware collieries. He formerly was sectional foreman at Jermyn and Marvine collieries.

RALPH SMITH, ventilation supervisor for the Hudson Coal Co., with which he has been connected since soon after World War I, has been transferred to Pine Ridge colliery, Wilkes-Barre, Pa., as mine foreman, vice Benjamin Jones, transferred. For a number of years he was in the company's engineering corps and later was a sectional foreman.

ROBERT VON STORCH, mine foreman at the Baltimore colliery, Hudson Coal Co., Wilkes-Barre, Pa., has been transferred to Pine Ridge colliery as assistant superintendent, vice JOSEPH B. MARTIN, resigned. Mr. Von Storch joined the engineering corps in 1930, then worked as a miner, sectional foreman and ventilation inspector.

KARL MILLER, safety supervisor with the Hudson Coal Co., with which he has been associated for more than 30 years, has been transferred to Baltimore colliery, Wilkes-Barre, Pa., as mine foreman, vice Robert Von Storch, promoted. Mr. Miller formerly was successively on the engineering corps, then colliery engineer and sectional foreman.

WILLIAM MUNCIE, sectional foreman at Olyphant colliery, Hudson Coal Co., Olyphant, Pa., has been transferred to the company's general office as assistant on machine mining, vice Gerald Blake, transferred.

BENJAMIN JONES, mine foreman at Pine Ridge colliery, Hudson Coal Co., Wilkes-Barre, Pa., has been transferred to the general office as safety supervisor, vice Karl Miller, transferred.

WARREN SHIRLEY, sectional foreman at Loree colliery, Hudson Coal Co., Plymouth, Pa., has been transferred to the general office as ventilation inspector, vice Ralph Smith, promoted.

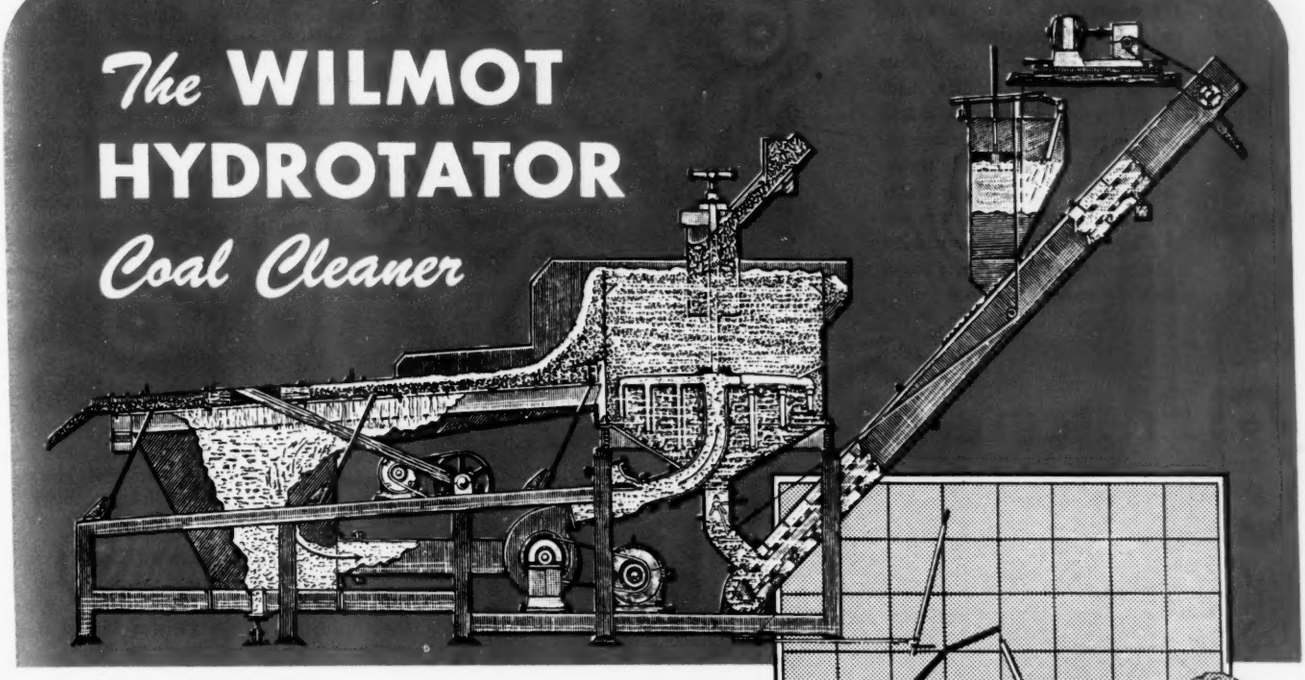
A. L. ROBERTS, formerly connected with the Island Creek Coal Co., has been appointed general superintendent of the Franklin County Coal Corp., operating in southern Illinois, vice JAMES WHITE, who has retired because of ill health.

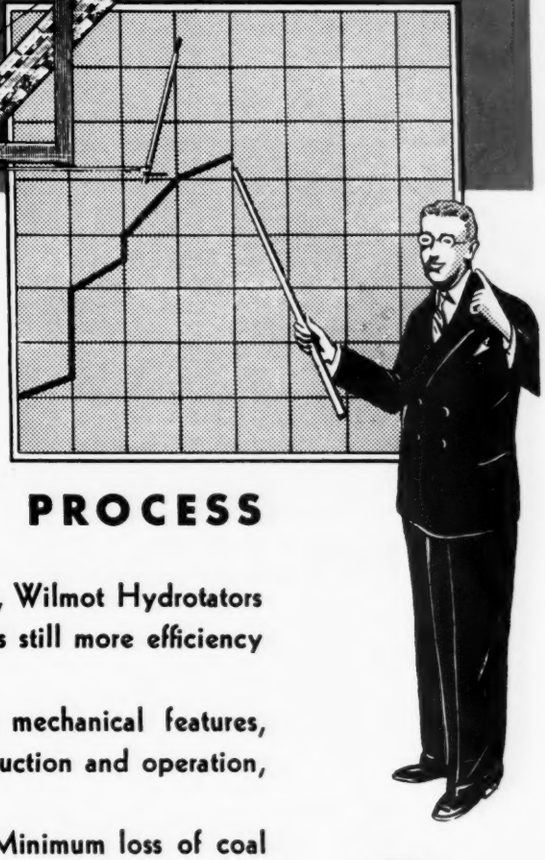
DR. MARCELLUS H. STOW terminated on Dec. 31 his service as chief of the Mining Branch, Civilian Production Administration, as also did F. W. CHRISTIANSEN, chief, Metal Mining Section; FRED CHASE, chief, Non-Metallic Section, and B. R. EWING, Mining Machinery Section. H. B. WICKEY, chief, Coal Section, will remain for a few months, handling all mining priority matters, and HAROLD MONTAG, Chief, Mining Machinery Section, also will remain for several months.

WILLIAM R. CHEDSEY, in charge of industrial training for the Columbus (Ohio) regional office of the War Manpower Commission, has been appointed an assistant professor of mining engineering in the West Virginia University School of Mines, Morgantown, W. Va.

MAJOR RAYMOND E. ZIMMERMAN, after five years of active duty in the Ordnance Department, U. S. Army, has been placed on an inactive status and has accepted a position

The WILMOT HYDROTATOR *Coal Cleaner*



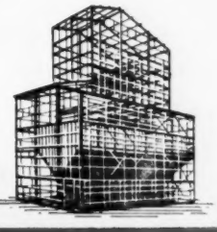


HITS A *NEW HIGH* IN AUTOMATIC CONTROL OF THE PREPARATION PROCESS

Now, as a result of recent engineering developments, Wilmot Hydrotators afford a higher degree of automatic control that adds still more efficiency to the Hydrotator principle.

This automatic action, combined with other new mechanical features, makes Wilmot Hydrotators superior in design, construction and operation, resulting in these definite advantages:

(1) Greater yield of clean, low ash coal . . . (2) Minimum loss of coal in refuse . . . (3) Increased preparation capacity . . . (4) Simplified operation . . . (5) Reduced operating and maintenance costs.



WRITE FOR HYDROTATOR BULLETIN HR

W WILMOT

"Wilmot Builds Better Breakers"

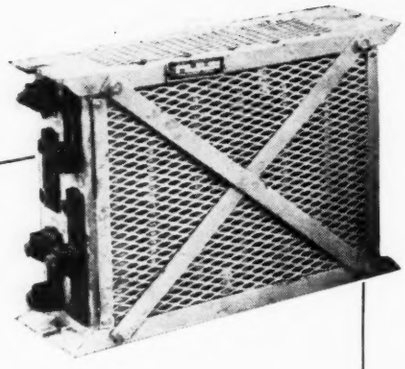
WILMOT ENGINEERING CO.

HAZLETON, PA.
Foundry and Shops:
WHITE HAVEN, PA.

Other Wilmot Coal Preparation Equipment: Hydro-Separators • Classifiers • Simplex Jigs • Portable Cleaners Crushing Rolls • Sizing Shakers • Bucket Elevators • Conveyors • Car Hauls • Keystone Rivetless Chain, etc.

WILMOT BUILDS BETTER BREAKERS

An external frame, supporting the helical coils in G. M. C. Resistances prevents damage due to jolts and vibration . . . thus insuring longer useful life. Added protection includes a shield to protect coils from outside injury. The coils are highly resistant to damage from mine water and mill fumes. Insulators are of a type not affected by sudden changes in temperature. For a really sturdy resistance unit, choose G. M. C.!



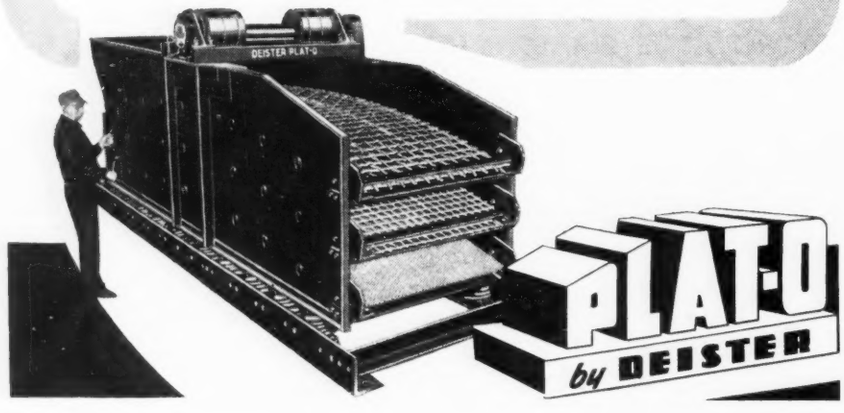
Protected Construction lets G.M.C. Resistances do a better job, longer!

Guyan Machinery Company
Logan, West Virginia

FASTER-More Accurate

The combination that means higher profits—faster grading and more accurate sizing, *plus* proved dependability—is yours in the Plat-O Vibrating Screen. Extreme sizes pass through quickly . . . oversizes bounce off rapidly . . . near mesh sizes stay on the screen longer . . . as a result of Plat-O's powerful, positive high speed, its adjustable opposed elliptical throw, and its forward conveying action at a relatively flat screen angle. For your toughest screening operations, why not specify Plat-O Vibrating Screens? One, two, three and four-deck models, ranging in size (actual screening area) from 2½' x 4' to 5' x 12'. Write today for details.

DEISTER MACHINE CO.
Fort Wayne 4, Indiana



as engineer in charge of preparation for the Hanna Coal Co., St. Clairsville, Ohio. He was overseas two years in the Asiatic and Middle East theaters, spending a large share of his time as ordnance officer, north Persia, for the Persian Gulf Command. Directly before his discharge he was connected with the Solid Fuels Branch, O.Q.M.C., Washington, D. C. Previous to his Army career, he was employed for many years with the Pittsburgh Coal Co. and its subsidiary, the Pittsburgh Coal Carbonization Co., as preparation and research engineer.

•

Preparation Facilities

OAK RIDGE COAL CORP., Raven Run Breaker, Raven Run, Pa.—Contract closed with Menzies Separator Co. for one 8-ft. Menzies cone to clean stove coal, also one 8-ft. cone to clean egg; feed capacity of each, 70 t.p.h.

PHILADELPHIA & READING COAL & IRON CO., St. Nicholas Breaker, St. Nicholas, Pa.—Contract closed with Deister Machine Co. for two No. 16 Deister Plat-O washing tables for special work on No. 1 buckwheat coal; capacity, 24 t.p.h.; additional equipment; believed to be now in service.

PHILADELPHIA & READING COAL & IRON CO., Oak Hill Colliery, Minersville, Pa.—Contract closed with Deister Machine Co. for nine No. 16 Deister Plat-O washing tables to clean Nos. 4 and 5 buckwheat coal; initial rated capacity, 75 t.p.h.; ready for operation.

•

Association Activities

HAZARD COAL OPERATORS' ASSOCIATION elected the following officers at its annual meeting, Dec. 6: President, George P. Fitz, president, Ajax Coal Co. (beginning his twelfth term); vice president, Paul Allais, president, Columbus Mining Co.; executive secretary, A. E. Sillcott; directors, M. R. Dayton, Finley Davis, C. Prewit Gum, J. T. Hatfield Jr., J. E. Johnson Jr., F. M. Medaris, D. T. Mitchell, C. B. Jackson Jr. and J. S. Trosper.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Central Appalachian Section, has elected A. S. Schoffstall, Huntington, W. Va., as chairman, vice E. B. Price, Inland Steel Co., Wheelright, Ky. C. E. Lawall, Huntington, W. Va., was elected first vice chairman; J. A. Hagy, Jewell Ridge, Va., second vice chairman; R. H. Allen, Charleston, W. Va., third vice chairman; and Charles Holland, Morgantown, W. Va., secretary-treasurer.

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Obituary

CARSON W. SMITH, 64, president and manager since 1922 of the Consolidated Coal & Coke Co., operating in Weld County, Colorado, died Dec. 8 at his home in Denver after a short illness. He went to Colorado in 1908 as superintendent of the Baum mine, Dacono, and later became prominent in the industry in the northern part of the State.

BIG FIST COAL SHOVELS

ALLOY GRADE

DESIGNED to meet the precise requirements of Coal Mining Work

EACH and every Big Fist Coal Shovel is a precision made tool, completely uniform in quality of materials and workmanship, rigidly adhering to the exact design established by WOOD SHOVEL Engineers. Big Fist Coal Shovels come in all required sizes, weights and lifts. Each one is fully guaranteed to deliver maximum service. Every Wood Shovel must make good . . . or we will.

THE WOOD SHOVEL and TOOL CO.
PIQUA, OHIO

A National Organization *specializing exclusively* in Shovels, Spades and Scoops.

MANGANESE ALLOY STEEL SHOVELS

DRY SAND

will get more coal out faster!

...as produced by PERFECTION CONE STOVE DRIERS

Spinning wheels won't pull heavy loads. It takes sand . . . *dry sand* . . . running freely from locomotive to track to give hard-driving wheels traction and real pulling power!

Get dry sand at HALF the usual cost! Use the "PERFECTION" Cone Stove Sand Drier. Standard size dries 8 to 10 tons in 8 hours . . . capacity can be increased to 12 to 14 tons. Write for full particulars.

Remember "PERFECTION" It's the best!

PRINCETON
Foundry & Supply Co. Princeton, W. Va.

ACME *mine car* **COMPRESSOR**

This mobile unit only 127 inches long—weighing only 3510 pounds—each and provided with coupling for towing—delivers 92 cu. ft. of air per minute at 100 lbs. pressure.

Designed especially for mine use it is adaptable to both high and low seam operations only 27½" high—particularly mechanized mining.

The car is equipped with one floating and two stub axles eliminating danger of derailment. Furnished in track gauges from 36" to 56".

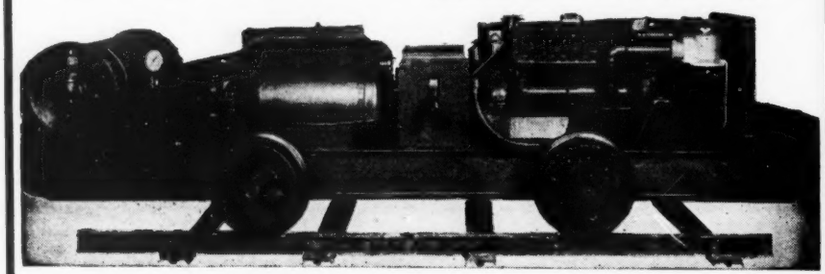
The "Lowboy" Model 110 shown offers the latest in mine car compressors—sturdily built—efficient—economical to operate.

Light Weight
Low Height

Compact
Mobile

WRITE FOR BULLETIN 3920

This bulletin shows how well the "Lowboy" is built—details of construction—illustrates sturdy frame design and gives complete specifications. *Write for yours today.*



ACME COMPRESSOR CO.
Williamson, West Virginia

EQUIPMENT APPROVALS

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in November, as follows:

Ohio Brass Co.—Type KG distribution box, two branch circuits; 250 and 500 volts, d.c.; Approvals 542 and 542A, respectively; Nov. 2.

Goodman Mfg. Co.—Type 115 Conway shovel; 15-hp. motor; 230 volts, d.c.; Approval 543; Nov. 6.

DR. N. D. BACHMAN, secretary of the Black Mountain Corp. and a member of Solid Fuels Administration District 8 advisory board, died suddenly Dec. 13 at Cincinnati of a heart attack. He had been associated with the Black Mountain organization and the Peabody Coal Co. for about 30 years.

•

Export Association Is Organized

An organization meeting of the Coal Exporters' Association of the United States was held in Washington, D. C., Nov. 29, when directors took office and elected officers. The new organization takes the place of the voluntary association that formerly handled matters of export and was supported mainly by the National Coal Association on behalf of its members. N.C.A. will continue this support. Headquarters of the new association is at 722 Washington Loan & Trust Building, Washington, D. C.

Officers elected are: president, Charles A. Owen, who was chairman of the informal group for some time, giving it much of his time; the office of vice president was left open for the present, and Mrs. Anna C. Van Sickler was named secretary and treasurer to carry on as heretofore. F. F. Estes, traffic manager of N.C.A., was made assistant secretary and treasurer. The board of directors consists of Mr. Owen; W. H. Carpenter, president, Dexter-Carpenter Coal Co., New York; C. W. Brown, president, C. W. Hendley & Co., Baltimore, and A. L. Lynn, assistant to the president, Island Creek Coal Co., Huntington, W. Va.

•

Hanna Organizes Research Service

Establishment of a new department by The M. A. Hanna Co. to conduct technological research in coal and other industrial lines in which the company is interested was announced Dec. 20. The new department is intended to provide research service for Hanna customers and also to supplement the work of existing coal-research organizations, Vice President James Prendergast said. It will be concerned not only with the technical problems of coal users but also with the development and advancement of the use of coal-derived hydrocarbons by the chemical, plastic, and other industries.

George D. Creelman, administrative as-

Shock Absorber Construction!

● General licked the job of building a wartime tire that would do the same jobs done by pre-war tires. To do this, General developed a new type of tire construction.

"Shock-absorber" construction, it was named . . . because above all it reduced tire failures resulting from service damage. It *stops* shock concentrations . . . *distributes* heaviest service loads uniformly . . . *preserves* the carcass for more *original* service . . . more *recap* service . . . at lowest cost.

These big, rugged Generals . . . like all General Tires . . . are built to America's top-standard of Top-Quality . . . are the product of skilled craftsmen and advanced tire engineering. It's no wonder, then, that General Off-the-Road Tires as well as Highway Tires are delivering the lowest cost tire performance in your industry.

THE GENERAL TIRE & RUBBER CO. · AKRON, OHIO

HOLDS FAST UNDER ROUGHEST CONDITIONS

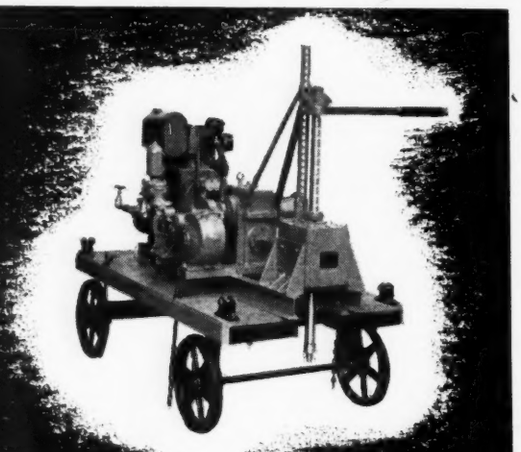
The oldest insulating tape known, popular for nearly 60 years. Preferred for wrapping-mining-machine and gathering-locomotive cables because it's built to withstand the roughest treatment. Only Ruberoid Insulating Tape has all these 7 features:

1 Double grip—both sides adhesive.
2 Great tensile strength—tough.
3 Won't tear, ravel or pucker.
4 Resists abrasion.
5 Acid- and alkali-proof.
6 Extra thick—one layer insulates.
7 Exceeds A.S.T.M. specifications by 300% in adhesiveness, 26% in tensile strength, 290% in dielectric strength.

RUBEROID
INSULATING TAPE

The RUBEROID Co.
Executive Offices, 500 Fifth Avenue, New York 18, N. Y.

CORE DRILLING FOR COAL



RUGGED PORTABLE CORE DRILLS

Acker Drills are simple to operate and easy to move in rough country.—They can be mounted on a small motor truck—drag—or trailer.

• • •

Determine depths of overburden before strip mining and thickness and quality of coal seams.

• • •

Tools and equipment for all sub-surface exploration.

• • •

Send for literature

ACKER DRILL CO. SCRANTON 3, PA.

sistant at the Institute of Gas Technology, Chicago, will direct the research department. A graduate of Harvard in 1931, Mr. Creelman, for eleven years was associated with the M. W. Kellogg Co., New York, chemical engineers, where he worked on pilot-plant and refinery operation and on engineering patent development. He later became research engineer for the Monsanto Chemical Co., St. Louis, and joined the Gas Institute in 1944.

The Hanna research department also has engaged Frank A. Howard, New York, formerly president of the Standard Oil Co. of New Jersey Development Corp., who will serve in a consulting capacity.

•

Heating Institute Formed at Spokane

Western Coal Heating Institute, the first organization of its kind in the Pacific Coast area, was organized Nov. 28 at a conference in Spokane, Wash., of coal producers, automatic burning equipment dealers and railroad representatives. At first the activities of the group will be limited to the Spokane trade area, where a campaign will be launched immediately to push sales of both solid fuel and burning equipment. If successful, the movement will spread to the entire Pacific Northwest area, according to a prediction by Leon J. Boyle, president, Boyle Fuel Co., who was elected president.

Other officers of the new organization include: vice president—A. F. Pierce, treasurer, Continental Coal Co.; secretary-treasurer—F. L. Crouteau, secretary-treasurer, Deadwood Ice & Fuel Co., both of Spokane. There also is a temporary board of 16 directors, representing all of the western coal producing fields, retailers, equipment distributors and power utilities. A managing director is to be elected later by the board of directors, which is proceeding with formal organization.

•

Belt Haulage Studied By Preparation Men

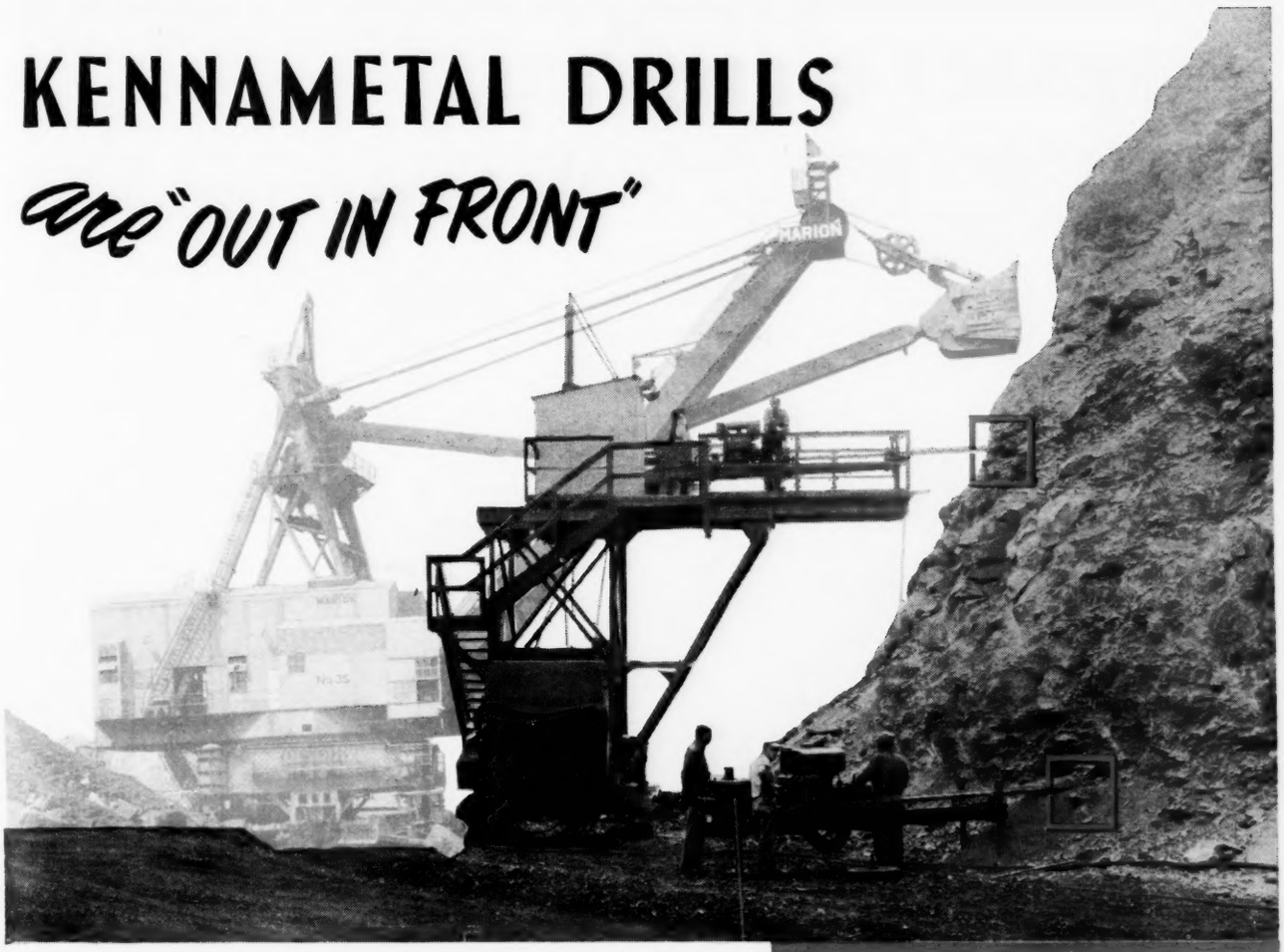
Belt haulage in underground coal mines was the topic at the November meeting of the Illinois Society of Preparation Engineers and Chemists, with A. B. Walter, construction engineer, Goodyear Tire & Rubber Co., holding the floor.

Belt hauls, he said, are satisfactory for all mining methods except longwall. With daily sidewise movement it is difficult to maintain perfect alignment. Belts under half-mile lengths may be mechanically spliced, but over that length they should be vulcanized. Cord belts are best vulcanized in any case. The heavy wear is in loading, so they should be made long. Belts with steel-cable carcasses may be made up to a length of six miles in a single belt, but such belts must be engineered to the job.

The rubber cover is about $\frac{1}{8}$ in. on top and $\frac{1}{16}$ in. on the bottom, or even down to $\frac{1}{32}$ in. when dry conditions prevail. Normal speed is about 550 f.p.m., but may vary with the method of mining from 175 to a maximum of 600 f.p.m. Gadgets for controlling feeder belts should be set about 30 ft.

KENNAMETAL DRILLS

are "OUT IN FRONT"



Before the shovel, the shot . . . before the shot, the hole . . . before the hole, the DRILL.

If it's a Kennametal Drill, results are outstanding—more holes, faster, better, cheaper.

You pay less for Kennametal-drilled holes, in time, in man-hours, in power, in bit replacement and resharpening.

If you're using these bits now, you will know what we mean. If you're not, the following typical field experience will be interesting:

- In overburden consisting of hard shale matrix imbedded with large limestone nodules, a Kennametal 6½" diameter three-way bit put down 15 holes 60 feet deep in 390 minutes actual drilling time—an average of 26 minutes each (21 minimum, 35 maximum). After this 900 feet of drilling the bit was not dull enough to require resharpening!

Here are the reasons for such good service:

- These bits are revolutionary in type and design. They are *tipped with Kennametal,* the same hard, tough, durable cemented carbide that for years has produced outstanding results when used on metal-working tools.
- Cutting edges are scientifically contoured for fast drilling to accurate size throughout the bit life, including many regrinds. An effective core breaker helps to keep the hole clear and prevent bit stalling.
- Bodies are sturdy, heat-treated alloy steel castings having welded-in bar steel shanks, adaptable to fit common types of augers. Hexagonal type is standard, but square or splined can be furnished when ordered.

A small investment in Kennametal Drill Bits will help you realize the maximum returns from a large investment in shovel capacity for removing overburden in stripping operations.

Four sizes are available—3½", 4", 5", and 6½" diameters. Additional particulars, and prices, sent promptly upon request.

Photograph above shows excellent condition of Kennametal Rotary Drill Bit after being used for one month, drilling holes in customary Seam 8 overburden.

KENNAMETAL

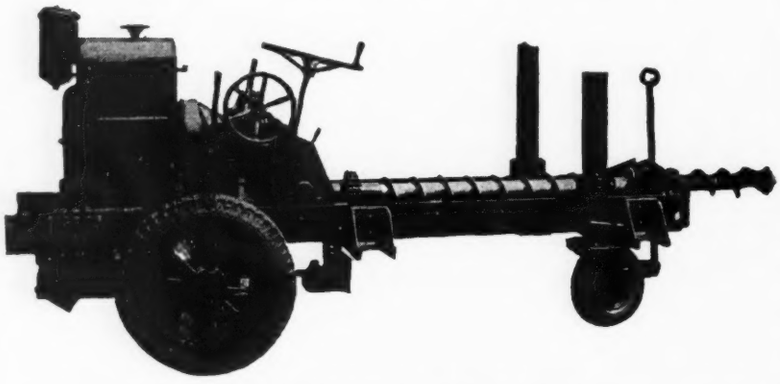
SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

PARMANCO Horizontal Drills

"Positive Control Drilling"

Parmanco Horizontal Drills give you "Positive Control Drilling." Parmanco Vertical and Horizontal Drills are today's leaders in low cost, low maintenance drilling—All Parmanco Drills are equipped with patented Parmanco augers. Used by leading strip mine operators—Write us your drilling problems.



PARIS MANUFACTURING CO.

PARIS, ILLINOIS

COOL

PROMET BEARINGS RUN COOL!

All bearing materials are not alike! Specializing in bronze bearings and bushings for coal mining equipment, with a specific formulae, designed for each application, we give you a money-back guarantee of longer service, lower maintenance cost.

Promet Bearing Bronzes can be run without lubrication in emergencies, even at red heat, suddenly cooled and returned to service without injury. Will not cut, stick to the shaft under ordinary conditions, nor powder under severest service. Can be machined at more than 500 feet per minute—twice as fast as phosphor bronzes.

PARTS FOR ALL EQUIPMENT. Jeffrey, Goodman, Westinghouse, General Electric, Sullivan, Joy, etc.
Rounds, hexagons, squares, bar stock. Rough cast, semi-finished, fully machined. Cored stock all sizes (by ⅛" steps) from ½" minimum core to 12" O.D. and 12" lengths.
PROMET BRONZE CASTINGS TO YOUR PATTERNS. Any size, shape or section, up to 5,000 lbs. each. Pattern making, designing and machining.
PROMET MINE SPECIAL BABBITT. Has a lead base, and fine velvety grain. Withstands tremendous loads at high speeds and temperatures. The coefficient of friction is considerably less than that of tin babbitts, reducing power loss and wear. Entire bearing surface wears uniformly without pitting. Manufactured entirely from pure virgin metals, perfectly alloyed and heat-treated. Unaffected by moisture. Simply heat to 900°-950° F. and pour. Can be heated to 2000° F. without injury. Repouring only refines it. No appreciable shrinkage, hence a better contact with supporting shell; a more solid, rigid bearing. Contains practically no dross. Supplied in 10 lb. pigs.

Write for booklet

PROMET — THE Engineered BRONZE

THE AMERICAN CRUCIBLE PRODUCTS CO.
1307 Oberlin Ave., Lorain, Ohio, U. S. A.

Prompt deliveries can usually be made from stocks maintained at

BECKLEY, W. Va., The Universal Supply Co., Corner 2nd Ave. and 2nd St.	Phone 3642
LORAIN, OHIO, The American Crucible Products Co.	Phone 6981
WILLIAMSON, W. Va., Williamson Supply Co.	Phone 1200

Other Representatives

ALTON, ILL., Frank E. Rhine, 623 Blair Ave.	Phone Alton 3-8624
BIG STONE GAP, VIRGINIA	C. P. Cawood
BIRMINGHAM 1, ALA., O. D. Lindstrom Equipment Co.	P. O. Box 103
CANTON, OHIO, Bowdil Company, Waynesburg Road	Phone 29-808
MT. LEBANON, PA., J. E. Nieser, 720 Roselawn Ave.	Phone LE 9826
DENVER, COLO., Urquhart Service, 16th Street at Blake	Phone Main 0331

from the loading point. Troughing is on an angle of about 20 deg.

Mine-run coal will travel up a 32-percent grade on a 1-in. bed of slack. Coal should be centrally loaded on the belt from a round-bottom chute at a speed equal to the belt speed. That reduces wear of the belt. Vertical curves should have a radius of 33 times the belt width. Hump curves are more difficult to lay out than sag curves.

Construction of belt haulage requires a minimum of grading, brushing and timbering. The carrying side of the belt is 16 to 18 in. above the return side. Self-aligning idlers are set about every 500 ft. Maximum elevation of conveying belts is 15 to 18 deg. To ovrcome rusting of idlers, they sometimes are made of stainless steel or aluminum. Rubber-disk rollers on the return side are very satisfactory for a refuse belt. Heavy lumps indicate the use of cushioned or pneumatic idlers under the loading point. To line up the belt, Mr. Walter begins at the tail pulley and follows along in the direction of travel. It may take three rounds to complete the job.

Some of the advantages of belt haulage are: Saves 12 to 23 percent of loading time compared to 2½- to 3½-ton cars; has more capacity in narrow places; requires little or no brushing; saves money in thin seams; causes less degradation; requires small crew; has simple drive; pushbutton control; reduced hazards; continuous flow of coal. Power is uniform. There is a balanced load in rolling mines as against locomotives, where power cost is based on peak loads.

Supplies are best handled by rail and storage-battery locomotive or by shuttle car. Belt builders object to the reversal of belts because they walk out of line. However, chain conveyors may be reversed to handle supplies.

Maintenance requires one man for each mile of belt and one for each five-room conveyor unit. Supplies require one man for each five units. Lights along the way help to locate any trouble. The edge of the return belt must be watched. Belt wear is on the bottom, so the proper location for a cleaner is in front of the tail pulley. Mr. Walter conceded that there is no first-class belt cleaner on the market, although one is badly needed.

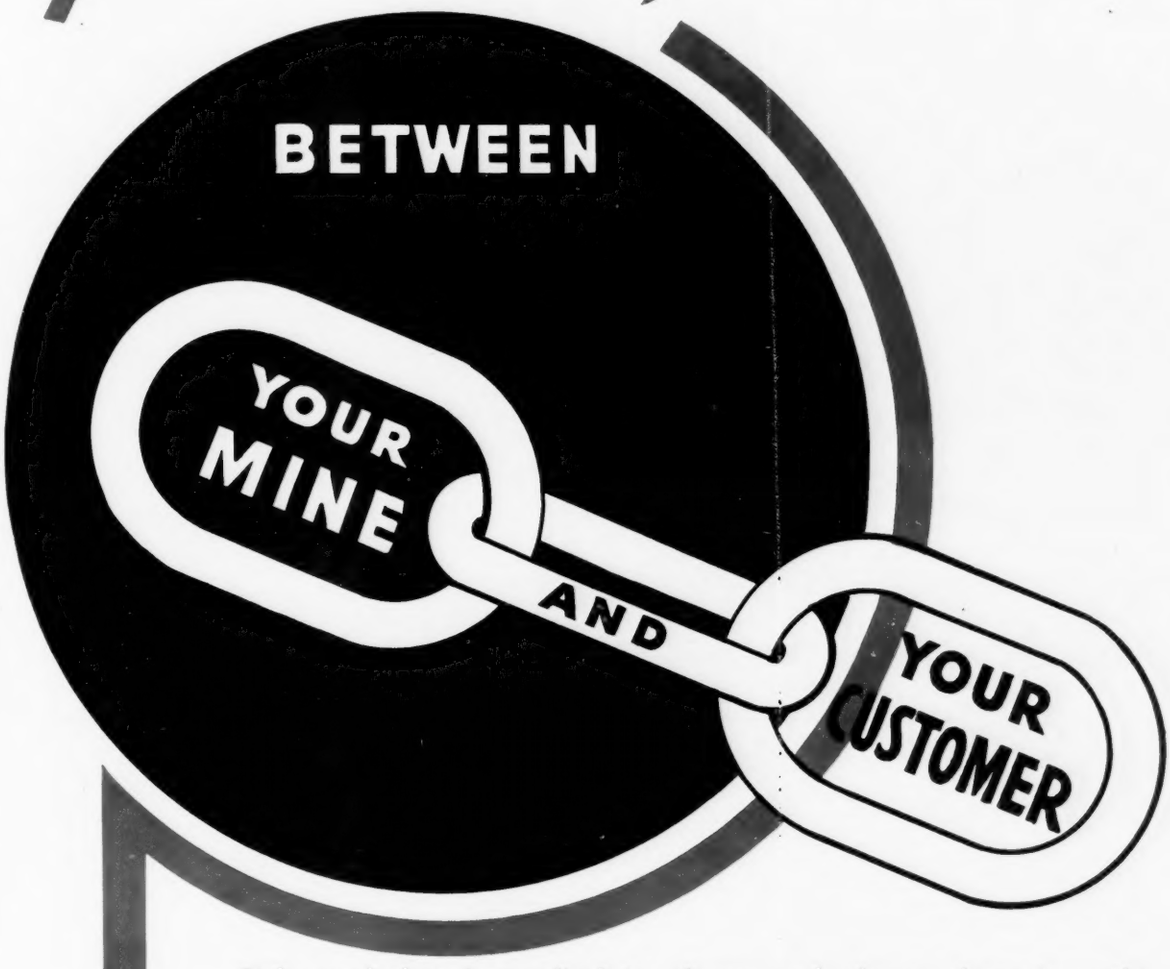
•

Pennsylvania to Have Three Safety Offices

With the purpose of reducing the hazards of mining to a minimum, the Pennsylvania Department of Mines has adopted a safety program to apply both to the anthracite and bituminous industry and to go into effect immediately after the first of the year. Plans call for the headquarters of the program in the hard-coal field being in Wilkes-Barre while the soft-coal headquarters will be in Ebensburg and Uniontown. The program to be carried out was outlined by the 1945 Legislature.

Richard Maize, State Secretary of Mines, reports that three trucks have been ordered for use in carrying out the program and that they are to be delivered as soon as automotive production permits. The vehicles, chassis only, were purchased at a cost of $1,500 each, and the State department has

How strong IS THE SALES LINK



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A special vehicle for underground transportation of personnel. Handles five men. Hauls men to working face quicker, without fatigue, enabling them to do a better job.

We completely overhaul and factory rebuild various kinds of mining machinery—cutters—loaders.

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asked bids for constructing special bodies on the chassis to carry the necessary safety equipment.

Examinations were to be held about mid-December for first-aid and mine-rescue instructors to serve in the program. More than thirty persons had made application for the jobs. The posts will pay $3,600 annually, except for crew chiefs, who will receive $4,000.

•

Mine Fatality Rate Declines Sharply

Accidents at coal mines of the United States caused the deaths of 50 bituminous and 12 anthracite miners in October last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors.

With a production of 38,580,000 net tons, the accident death rate among bituminous miners in October last was 1.30 per million tons, compared with 1.49 in the preceding month and 1.68 in October, 1944.

The anthracite fatality rate from accidents in October last was 2.28, based on an output of 5,259,000 tons, against 1.95 in the preceding month and 2.17 in the tenth month a year earlier.

For the two industries combined, the accident fatality rate in October last was 1.41, compared with 1.53 in the preceding month and 1.73 in October, 1944.

Fatalities during October last, by causes and States, as well as comparable rates for the first ten months of 1944 and 1945 were as follows:

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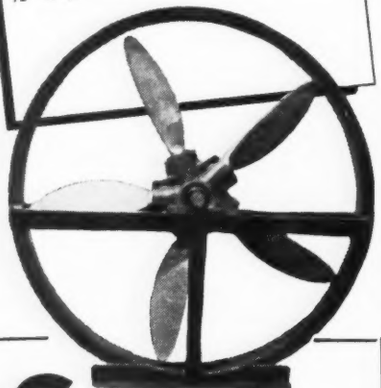
Made in 4 sizes, 36" 48," 60" and 72" All have cast aluminum blades—60" and 72" adjustable pitch. Write for details.



GUYAN MACHINERY COMPANY

Logan W. Va.

U. S. COAL-MINE FATALITIES IN OCTOBER, 1945, BY CAUSES AND STATES

State	Underground: Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Other Causes	Total Underground	Open-Cut	Surface	Grand Total
Alabama	1	..	2	..	1	1	..	5	..	..	5
Colorado	2	..	..	..	..	..	..	2	..	1	3
Illinois	1	..	1	..	..	..	..	2	1	1	4
Indiana	2	..	1	..	..	..	..	3	..	..	3
Kentucky	2	..	2	..	..	..	..	4	..	..	4
Ohio	3	..	1	..	..	..	..	4	..	..	4
Penna. (bit.)	4	..	..	..	..	..	..	4	..	..	4
Tennessee	..	..	..	..	..	..	1	1	..	..	1
Utah	..	..	..	..	..	..	..	..	..	1	1
Virginia	3	..	..	..	..	..	..	3	..	..	3
West Virginia	9	..	3	..	1	1	..	14	..	1	15
Wyoming	..	1	1	..	..	..	1	3	..	..	3
Total bituminous	27	1	11	..	2	2	2	45	1	4	50
Penna. (anth.)	8	..	..	1	1	..	2	12	..	..	12
Grand Total	35	1	11	1	3	2	4	57	1	4	62

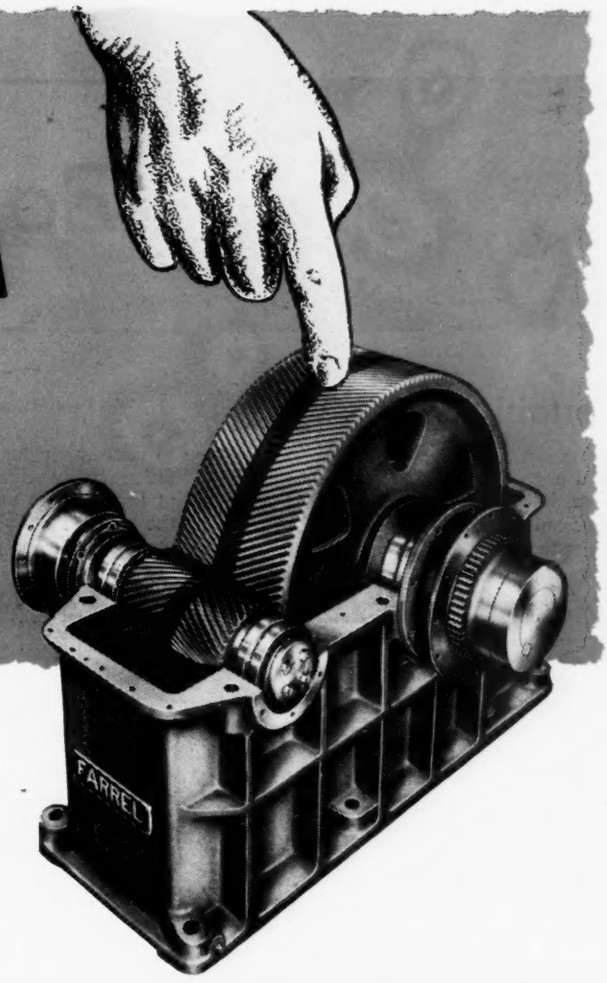
DEATHS AND FATALITY RATES AT U. S. COAL MINES, BY CAUSES OF ACCIDENTS*

January–October, 1944 and 1945

Cause	Bituminous: Number Killed 1944	1945	Killed per Million Tons 1944	1945	Anthracite: Number Killed 1944	1945	Killed per Million Tons 1944	1945	Total: Number Killed 1944	1945	Killed per Million Tons 1944	1945
Underground:												
Falls of roof and face	504	362	0.963	0.760	69	60	1.267	1.302	573	422	0.992	0.808
Haulage	191	165	.365	.346	18	18	.330	.391	209	183	.362	.350
Gas or dust explosions:												
Local	8	9	.015	.019	3	5	.055	.108	11	14	.019	.027
Major	22	39	.042	.082	..	..	....	....	22	39	.038	.075
Explosives	14	20	.027	.042	16	8	.294	.174	30	28	.052	.053
Electricity	30	19	.057	.040	3	2	.055	.043	33	21	.057	.040
Machinery	29	34	.055	.071	..	2	....	.043	29	36	.050	.069
Shaft	5	10	.010	.021	5	1	.092	.022	10	11	.017	.021
Miscellaneous	93	14	.178	.030	13	10	.238	.217	106	24	.184	.046
Stripping or open-cut	24	20	.046	.042	8	2	.147	.043	32	22	.055	.042
Surface	45	47	.086	.098	9	9	.165	.195	54	56	.093	.107
Total	965	739	1.844	1.551	144	117	2.643	2.538	109	856	1.919	1.638

*All figures subject to revision.

You can
put your finger
on the **EXTRA**
LOAD-CARRYING
CAPACITY
in these

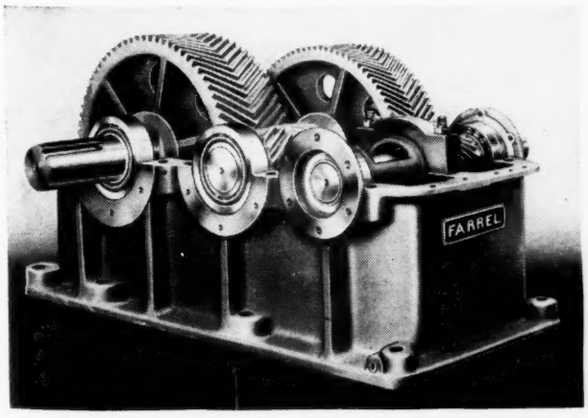


SPEED REDUCERS

ONE look at the continuous tooth herringbone gears in a Farrel Speed Reducer tells you what gives these gears their extra strength and load-carrying capacity.

In place of the center groove found in some herringbone gears, you see the extra tooth area formed where the helices meet to make the teeth continuous across the face. This extra tooth area is known as the *backbone.* It puts the entire width of the gear to work, providing greater capacity to withstand shocks, stresses and heavy loads.

Precision generated by the famous Farrel-Sykes process, the *Gear with a Backbone* is widely known throughout industry for its smooth, quiet, efficient operation. Its combined characteristics of overlap or interlacing of the teeth, gradual engagement and inclined line of pressure distribute the load on the teeth uniformly, reducing wear and maintaining correct tooth action through a long gear life.



Other features which contribute to smooth, efficient power transmission in Farrel Speed Reducers include rigid and accurately ground shafts properly mounted in roller bearings, and heavy section cases that hold rotating elements in precise alignment.

These speed reducing units are available in a complete range of sizes for any capacity. Ratios of single reduction units range from 1½:1 to 10:1, double reduction units up to 60:1, and triple reduction units up to 180:1. Write for descriptive Catalog No. 438.

FARREL-BIRMINGHAM COMPANY, INC.
344 Vulcan St., Buffalo, N. Y.
Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.
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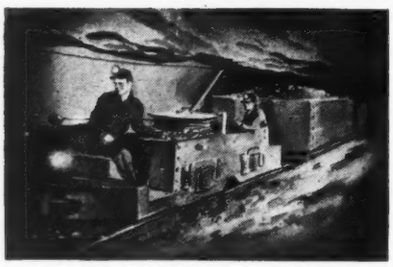
FB-283

FARREL
The Gear with a Backbone

Farrel-Birmingham



Equipment News

Portable Brazers

Brazing, an old but still not too generally used method of joining members of copper, brass, bronze or various alloys, has had one handicap in that there was a lack of brazing apparatus that could be readily taken to the job. This need has been met by Westinghouse Electric Corp., East Pittsburgh, Pa., with a self-contained family of brazing sets that require only a connection to a 220-volt power source. These sets consist essentially of a transformer to provide high currents at low voltage, suitable voltage selectors, controls and carbon-tipped tongs that can be clamped over the pieces to be joined. The high currents flowing through the carbons bring them to incandescence, quickly raising the material to brazing temperatures, which are from 1,200 to 1,500 deg. F.

Three sizes, 5, 10 and 20 kva., comprise this group of mobile brazing elements. The 5- and 10-kva. units are air-cooled; the 20-kva. unit is fan-cooled and has a self-contained water cooling and recirculating system used to cool the brazing cables and tongs. This cooling system permits the use of a small-size portable unit for medium brazing work. The smallest unit weighs about 30 lb.; the middle one, 100 lb.; and the 20-kva., 250 lb. The corresponding secondary currents are 625, 833 and 1,667 amp.

Silicone Greases

Low- and high-temperature serviceability with less than 2 percent bleeding after 16 hours at 230 deg. F. with ball bearings operating at speeds of 10,000 r.p.m. feature two new silicone greases, DC 33 and DC 44, states the Dow Corning Corp., Midland, Mich. DC 33 was designed for low-temperature lubrication and is effective from —94 to 300 deg. F. DC 44 was designed for high-temperature lubrication and is effective from —4 to 345 deg. F. Water resistance of both is said to be comparable to that of calcium- or lithium-based petroleum greases. Low volatility and minimum bleeding particularly recommend their use for lubricating sealed ball bearings and also bearings operating at abnormally low and high temperatures. It is stated that they may be employed for lubrication of low-speed equipment operating at temperatures up to 500 deg. F.

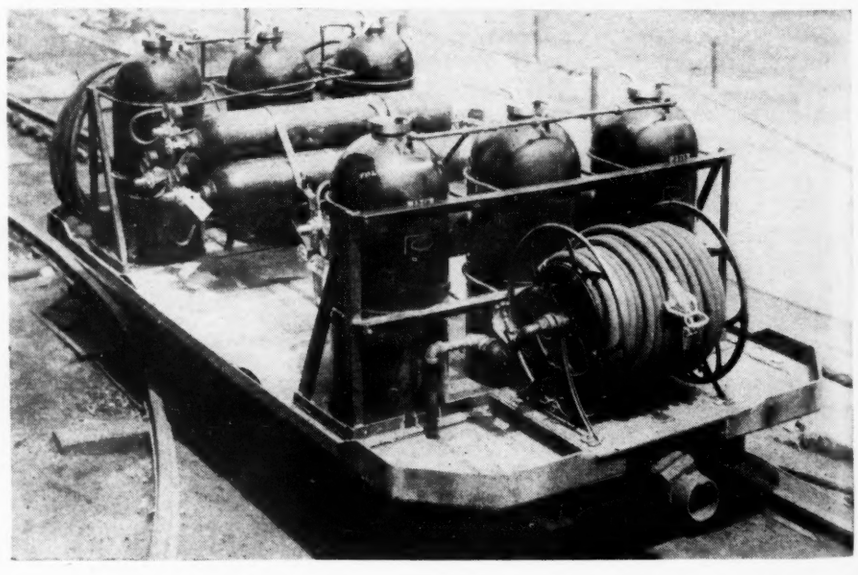
The greases are light brown and are compounded with metallic soaps selected for their heat stability. Considerable development still is in progress. It is found that even though the greases are perfectly stable at high temperatures it sometimes is advisable to change bearings to larger clearance to compensate for the bearing temperature differential. Preliminary tests show that use of bronze cages materially lengthens life of the bearings at high temperatures. Development for use in journal bearings and for extreme pressure lubrication still is in the laboratory stage. These two greases supplement the previous DC 31 and 41 types.

Fire-Fighting Car

Dugas Division of Ansul Chemical Co., Marinette, Wis., offers a new mine fire-fighting car for use in coal mines. Constructed at the request of a large Pennsylvania coal mine, the car has the chassis of a standard mine car, with three 300-lb. tanks of Dugas dry chemical. Two of the tanks, connected in parallel, operate through a 100-ft. hose, while the single tank has 50 ft. of hose. The dry chemical tanks are powered by three nitrogen cylinders placed horizontally in a rack behind the chemical tanks.

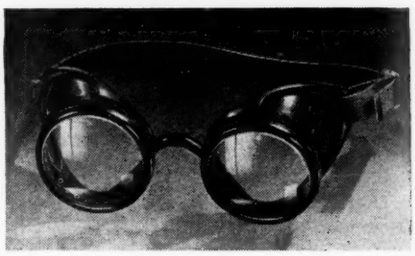
In addition to the dry chemical tanks the car also carries 100 gal. of water with a reel holding 100 ft. of hose having a nozzle that will throw a straight stream or spray. A single nitrogen cylinder supplies pressure for expelling the water to extinguish embers that may remain after the dry chemical has knocked down the flames.

Designed to operate as a self-contained unit, the Ansul car also carries several Dugas dry chemical hand fire extinguishers and first-aid equipment.



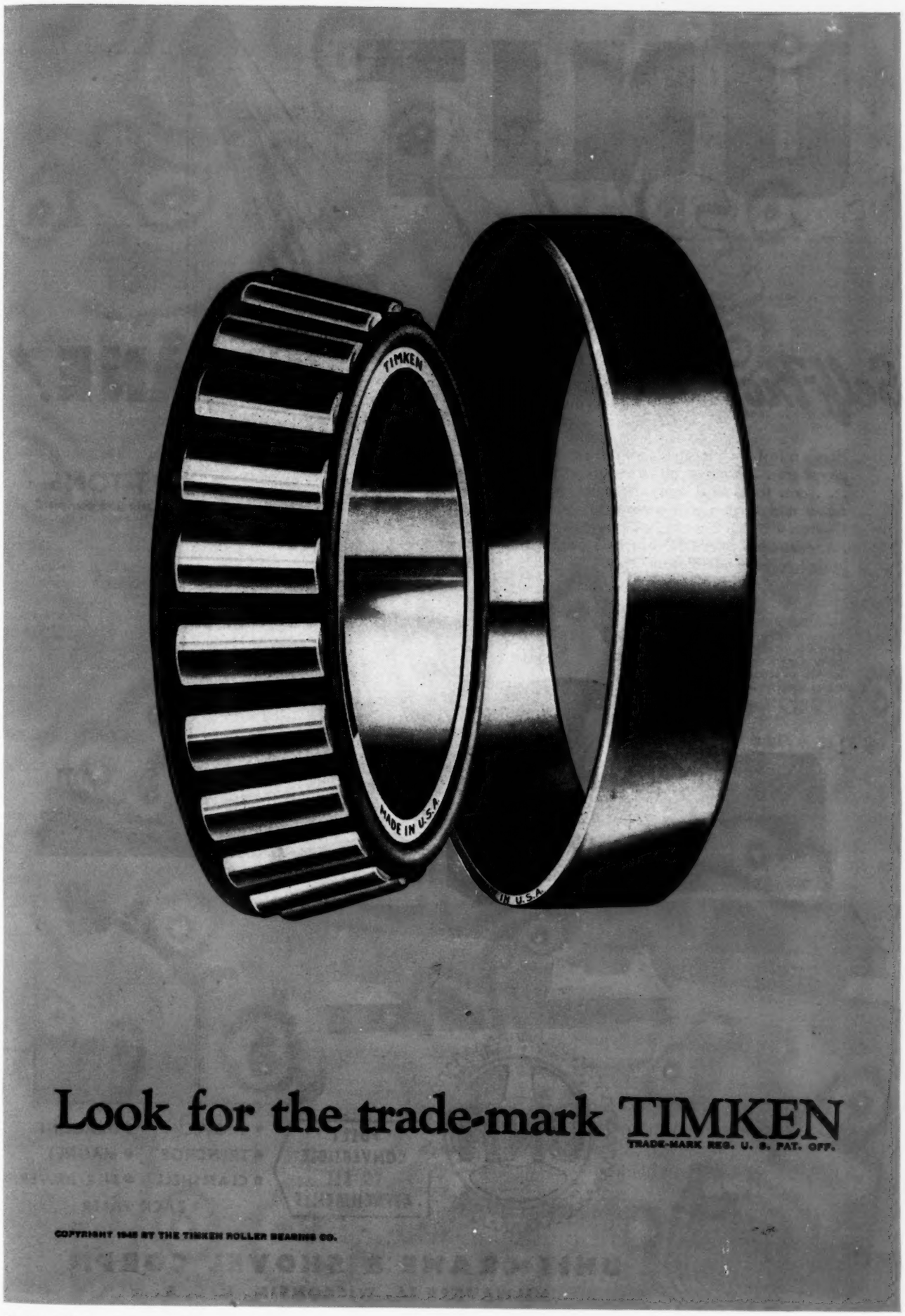
Protective Equipment

Greater safety and comfort to the worker are provided by its new dust goggle, states the American Optical Co., Southbridge, Mass. The goggle is equipped with an acetate eyecup, increasing the angle of vision and comfort for the wearer. In addition, a thin wire-mesh screen is installed inside each side shield, giving maximum protection against fine dust. Eyecups are shaped to the contour of each eye and fit snugly against



the face. The ventilating system extends over a larger area to reduce the possibility of fogging. The goggle contains AO Super Armorplate lenses with solid-fiber retaining rings. Rubber cushion is available on request.

Designed to stay in place and give rugged protection for both front and back of fingers two new AO Stay-Set cots are further American Optical Co. offerings. It is practically impossible to turn or twist them when in use, according to the company. One new cot is made from selected grain leather for



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Self-Propelled MOBILE CRANE!

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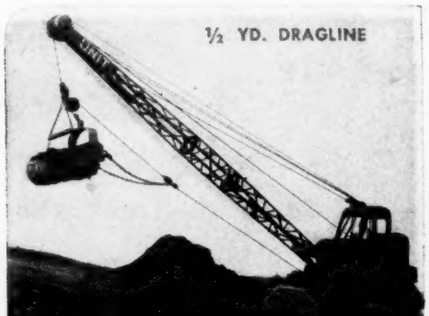
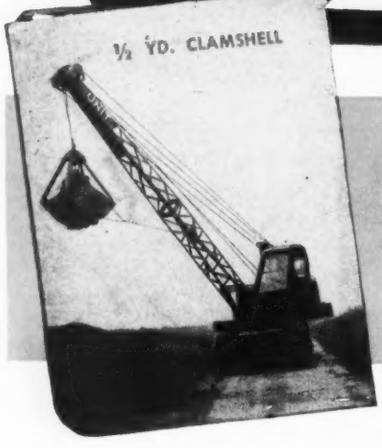
Here's a fast, mobile UNIT that rides on rubber . . . goes anywhere . . . over rough terrain or on paved highways . . . gets there in a hurry. Has the well-known UNIT power and stamina, plus motor truck speed and mobility. Operated by ONE man . . . powered by ONE engine . . . controlled from ONE position in cab. Ultra-modern in design, yet available at LOW COST. Ask for bulletin.

5-TONS
(7 tons with Outriggers)

New, Full Vision Cab—pioneered by UNIT — provides maximum visibility. Operator can see in ALL directions. Promotes safety. Increases efficiency.





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- MAGNET
- CLAMSHELL
- PILE DRIVER
- BACK FILLER

UNIT CRANE & SHOVEL CORP.
MILWAUKEE 14, WISCONSIN, U. S. A.

use where sensitivity of touch is important, such as in soldering small wire. The other new cot is made from high-grade chrome-tanned cowhide leather for rough work, such as polishing, burring or grinding small parts. Both cots are available in small, medium and large sizes.

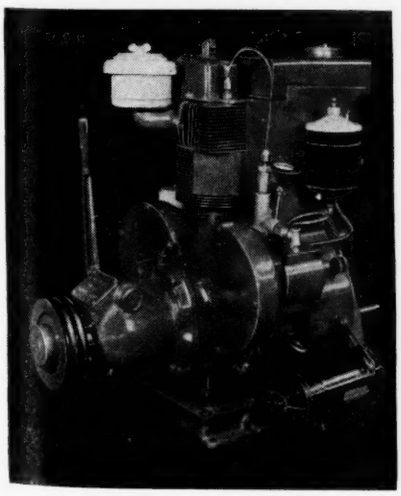
Complete leg protection, easy adjustment and quick release were the three major objectives in the design of a new legging and spat also announcd by American Optical. The legging protects the front, back and sides of the leg from the instep to knee. The spat provides full protection for the instep and ankle. The legging and spat are of similar construction except for the shorter length of the spat. They are available in chrome leather (specially tanned to resist heat and hot metal splashes), asbestos and fire-resisting duck. All leggings have a chrome-leather flare over the instep.

•

Diesel Engine

A new diesel engine offered by R. H. Sheppard Co., Hanover, Pa., is said to be not only the smallest diesel ever built for commercial use but also the only stationary diesel that is air-cooled. Cooling efficiency is accomplished by directing a fan-driven stream of fresh air over the cooling fins.

Over all the engine stands 28¼ in. high., 20¾ in. wide and 22½ in. long with crank removed. It is a single-cylinder 4-cycle diesel developing 3¾ hp. at 1,800 r.p.m. It



CEMENT GUN COMPANY
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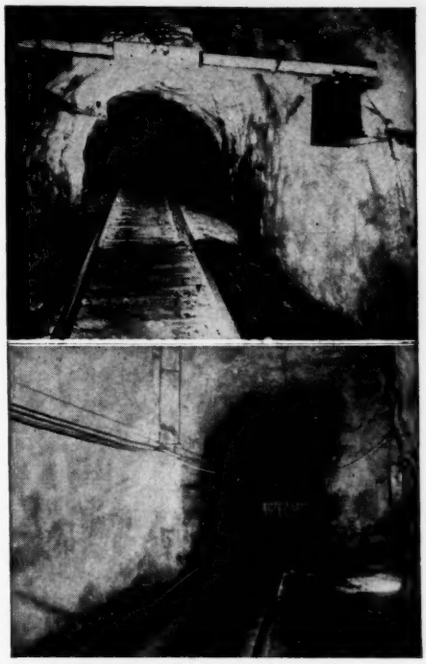


LOWER MAINTENANCE COSTS WITH "GUNITE"

Modern coal mines have used "GUNITE" for many years for lining the sides and roofs of haulageways, slopes, entries and underground rooms with resulting big savings in maintenance costs.

Summed up briefly, "GUNITE" offers the following:

1. Elimination of roof fall hazards, and attendant cleaning up.
2. Elimination of a great deal of timbering.
3. Additional head room and better visibility due to the light colored "GUNITE" surface.
4. Clean entries and passageways.
5. Better ventilation due to greater unobstructed area.
6. Surface of "GUNITE" retains rock dust readily.
7. Lower mine maintenance costs.

We sell the equipment or we do the work by contract. Write today for your free copy of our new Bulletin D-2300.

MANUFACTURERS OF THE "CEMENT GUN"

A New Locomotive Backed by 25 Years' Experience in the Battery Locomotive field!

GREENSBURG
"RANGER" STORAGE BATTERY
LOCOMOTIVES

All Locomotives CUSTOM-BUILT to your requirements

FEATURES

Oil-tight, leak-proof transmission. Use regular auto oil; change every 6 months.

Strong. Simple. Low maintenance cost.

Extra-long journal springs assure better trackability.

Large motor, to assure more horse power per ton weight of locomotive.

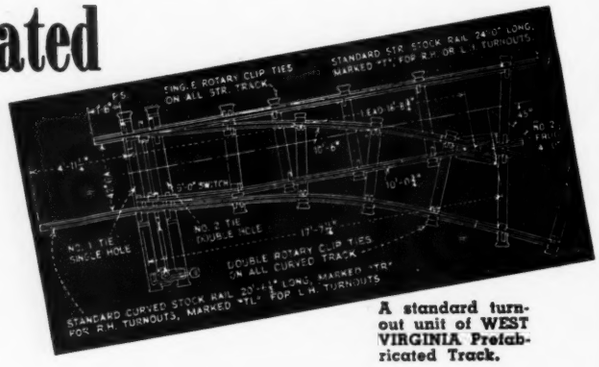
Can be equipped with hydraulic brake.

This locomotive being used for main line haulage at the Blacksmith Coal Company, Novinger, Missouri. This is a 4½ ton locomotive, operating on 30" gauge track. This locomotive built from 3½ to 10 tons — either single or double motor drive — 16" to 56½" track gauge. Also factory rebuilt storage battery locomotives with new locomotive guarantee.

MORE HAULING FOR LESS STORAGE BATTERY CAPACITY

THE GREENSBURG MACHINE CO.
Makers of Custom-Built Storage Battery Locomotives
101 STANTON ST., GREENSBURG, PA.

Prefabricated Track-built from drawings of your mine layout!


SINGLE ROTARY CLIP TIES ON ALL STR. TRACK
STANDARD STR. STOCK RAIL 24'-10" LONG, MARKED "TL" FOR R.H. OR L.H. TURNOUTS
NO. 1 TIE SINGLE HOLE
NO. 2 TIE DOUBLE HOLE
DOUBLE ROTARY CLIP TIES ON ALL CURVED TRACK
STANDARD CURVED STOCK RAIL 20'-1" LONG, MARKED "TL" FOR L.H. TURNOUTS
STANDARD CURVED STOCK RAIL 20'-1" LONG, MARKED "TL" FOR R.H. TURNOUTS

A standard turnout unit of WEST VIRGINIA Prefabricated Track.

No longer is it necessary to make up track as you go, or to lose valuable time in shifting track. Now you can get Prefabricated Track in lengths that will be standard for your mine—and you can move it *fast*, using only a wrench and a hammer to reinstall the track. All we require is a drawing of your panel layout and WEST VIRGINIA Prefabricated Track will be furnished ready to use. Write for full particulars.

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THE FAMOUS
MESCOWELD M8-F RAIL BOND

•Preferred for many years because it has been found to do a superior bonding job—better current conservation, greater convenience, longer life.

The Mescoweld line of Rail Bonds consist of 18 soundly engineered types to meet every known bonding requirement. Write for catalog or phone Hemlock 8332. IMMEDIATE DELIVERIES.

MOSEBACH
ELECTRIC & SUPPLY CO., 1115 ARLINGTON AVE., PITTSBURGH, PA.

FLEXIPIPE
The improved flexible tubing for mine and tunnel ventilation

This flexible air tubing is ready for immediate, easy installation. On account of its flexibility, it can be put up or taken down in a fractional part of the time required by a more rigid means of face ventilation.

Write for free sample and full information.

BEMIS BRO. BAG CO.
412 Poplar Street, St. Louis 2, Mo.

is equipped with both hand and 12-volt electric starting. Its fuel tank holds 9/10 gal.; fuel consumption is ½ lb. per brake horsepower hour.

•

Drafting Pencil

A new refillable draftsman's pencil, ingeniously designed to eliminate the annoyance of broken lead, is offered by the Charles Bruning Co., Inc., 4654-8 Montrose Ave., Chicago 41, Ill. The No. 3583 pencil has a new type of clutch to hold the lead firmly in a non-slip rubber grip that is said to prevent the usual nicking and scoring of lead that cause breakage.

Its long barrel permits the use of any full-length standard drafting lead, from 0.079 to 0.070 in., which includes HB and 9H. The grip is knurled to provide a firm hold and to prevent slipping, whether it is held close to or away from the point. The tapered point and well proportioned grip merge smoothly with the lead, offering, especially when lettering, greater finger comfort. An adjustable cap provides easy identification of the degree of lead used.

•

Fog-Free Goggle

Welsh Mfg. Co., Providence, R. I., offers a fog-free goggle with large plastic polaroid non-polarizing lens that is said to provide wide, unobstructed vision and to be non-shatterable. The company asserts that various refinements have increased its effectiveness. An easily attached and removable tinted slip lens is now available to provide glare protection. It also increases impact resistance. The interior design also has been modified to insure better fit around the nose and greater comfort for the wearer.

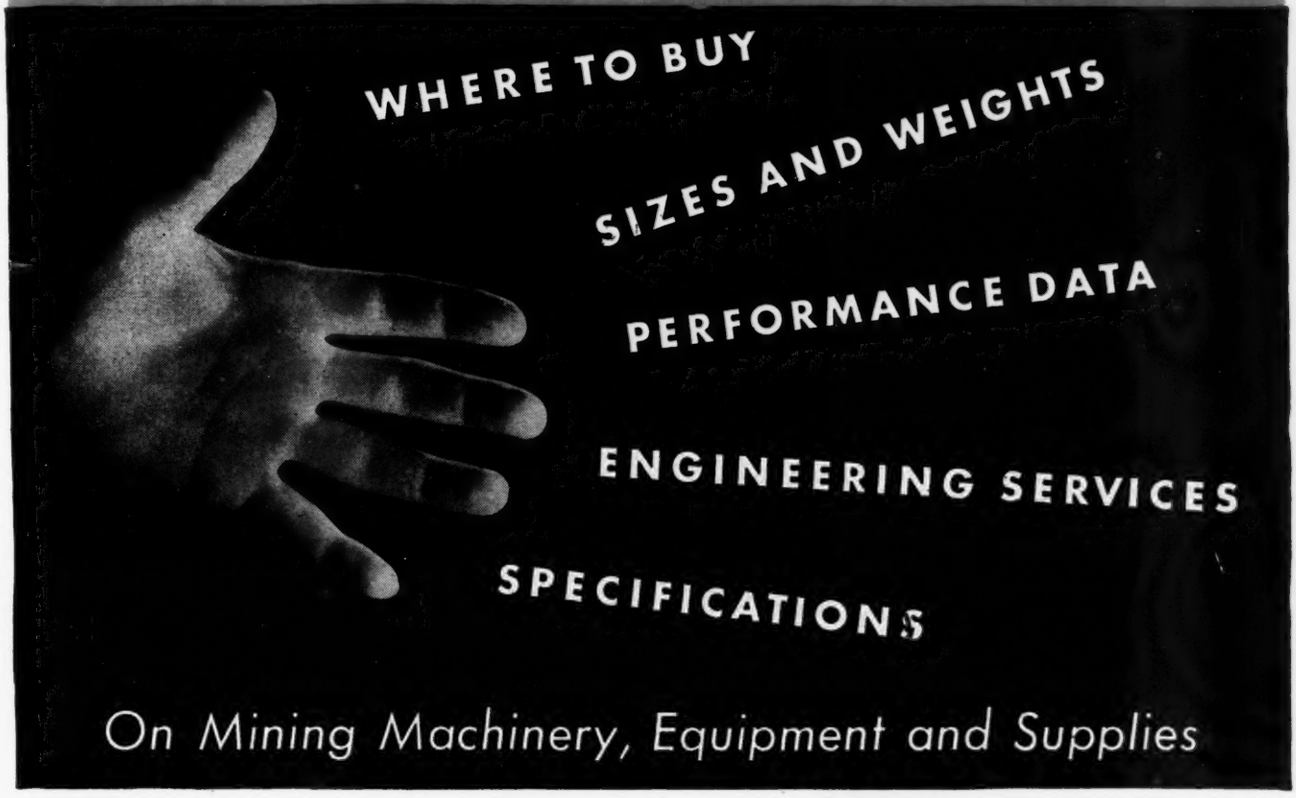
•

Friction Shovels

An electric clutch, it is stated, has been successfully applied to large friction shovels and has proved eminently successful. Already in operation are new P&H 3-yd. excavators equipped with the "Magnetorque" unit built by the Harnischfeger Corp., Milwaukee. The new clutch, it is said, transmits power for swing and propel motions by electromagnetic forces, doing away with all frictional connections between the mechanism itself and the engine that drives it.

On the new 1055 friction shovel, the Magnetorque unit is mounted on the jackshaft in much the same manner as the conventional swing clutch and is driven by the

At Your Finger Tips...



WHETHER it's a crusher, some bearings or a reel of wire rope that you're going to buy for your company, look it up in *The Mining Catalogs*. The information you get in *The Mining Catalogs* is up-to-date, concise but complete, and easy to locate quickly. Manufacturers have condensed their complete catalog information to speed up your search.

10,000 men responsible for specifying or requisitioning are using *The Mining Catalogs* regularly. It makes those jobs easier. Be sure you are on the list to receive your copy of the 1945-1946 edition . . . send the coupon today.

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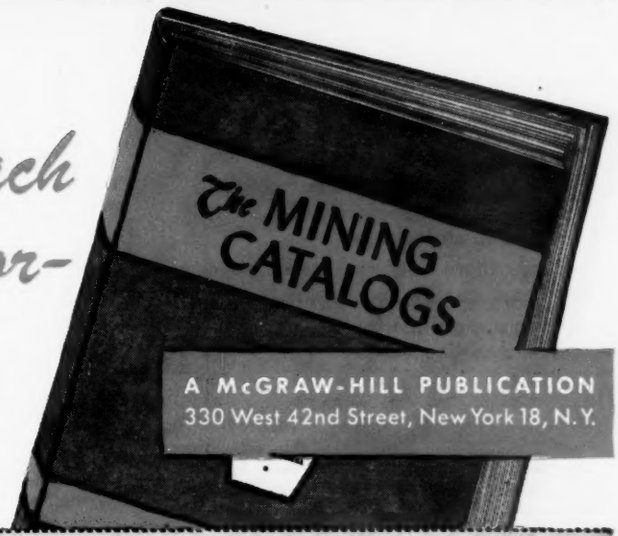

THE MINING CATALOGS, 330 West 42nd St., New York 18, N. Y.

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Name..... *Title*.....

Company Name.....

Company Address..... *State*.....

The nature of our operation is.....

The boys who are doing the production job for you won't ever be knocked out for lack of air if you keep a dependable fresh supply of air coming their way as they work.

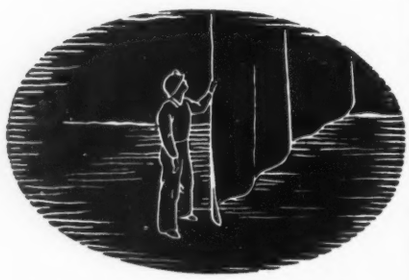
Many mines are doing this by using

ABC
JUTE BRATTICE CLOTH

● For greater safety and more efficient ventilation specify ABC Brattice Cloth. Flame, water, fungus, and abrasion will not harm it . . . passing cars or machinery cannot pull it down or tear it. Closely woven construction insures maximum wear-resistant quality and minimum air-leakage.

Combined, these features assure you of the finest quality and results.

Investigate . . . get the facts on ABC—the *better* brattice cloth.



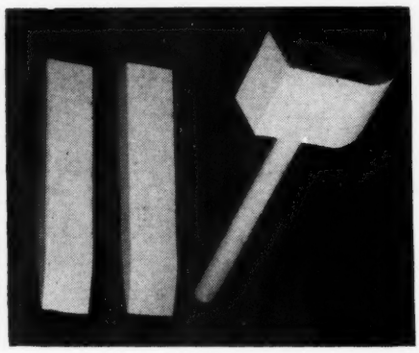
AMERICAN
BRATTICE CLOTH CORP.
WARSAW - INDIANA

240-h.p. diesel engine. On the diesel a small generator furnishes excitation for transmission of power. Operation of both swing and propel motions is effected through the Magnetorque unit by two small controls at the operator's station. Having only recently begun operations on a Pennsylvania mining job, it also is designed for general contracting.

•

Mallets and Wedges

J. V. Hammond Co., Spangler, Pa., offers wooden mallet and wedge sets to open explosives cases. Being made of wood, they are said to eliminate any possible danger



from sparks that might be produced by using metal hammers or wedges. The set is made from selected hardwood and the mallets are doweled to prevent their splitting.

•

Welding Compound

Instantaneous creation and maintenance of a metallic welding arc where low currents and small-diameter electrodes are employed is aided by its new "Strike-Easy" compound, according to the Electric Welding Division of General Electric Co., Schenectady, N. Y. This new arc-welding compound, in paste form, is easily applied for use on any kind of metal with any type electrode. It is available in 1-lb. glass jars and is completely ready for use, the division declares.

•

Trade Literature

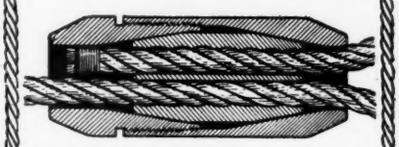
Arc Welding Machines—Air Reduction Sales Co., 60 East 42d St., New York 17. Booklet describes new and improved Wilson "Bumblebee" a.c. transformer arc welding machines. Among the units described are the 300- and 500-amp. standard and all-weather models and the new 200-amp. "Bumblebee." Additional sections are devoted to small transformer-type a.c. welders, running gear, remote control, and a complete line of shielded arc electrodes for a.c. welding. Engineering data and complete specifications are supplied.

Safety and Relief Valves—Farris Engineering Co., 400 Commercial Ave., Palisades Park, N. J. Catalog 45 describes a complete line of safety and relief valves, including many new valve designs and improvements in old designs. A ready-reference pictorial index chart shows line drawings of all basic Farris valve types. With this chart

LOOK INTO . . .

Cabl-ox

THE NEW WIRE ROPE CLAMP That Really Holds the Line!



CABL-OX clamps work on a brand new wedging principle. Holding power increases with the load and exceeds tensile strength of rope used. Does not crush and weaken rope like old style U-clips. Assembly is fast, neat . . . saves breakdowns, equipment, injuries and expense. Can be used over and over. Cadmium plated.

Cabl-ox

Made in all sizes from 1/16" to 3/4". For all wire rope applications.

• FASTER • SURER • SAFER
• STRONGER • ECONOMICAL

Ask your distributor or write for illustrated folder and prices.

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ST. LOUIS SNAPSHOTS

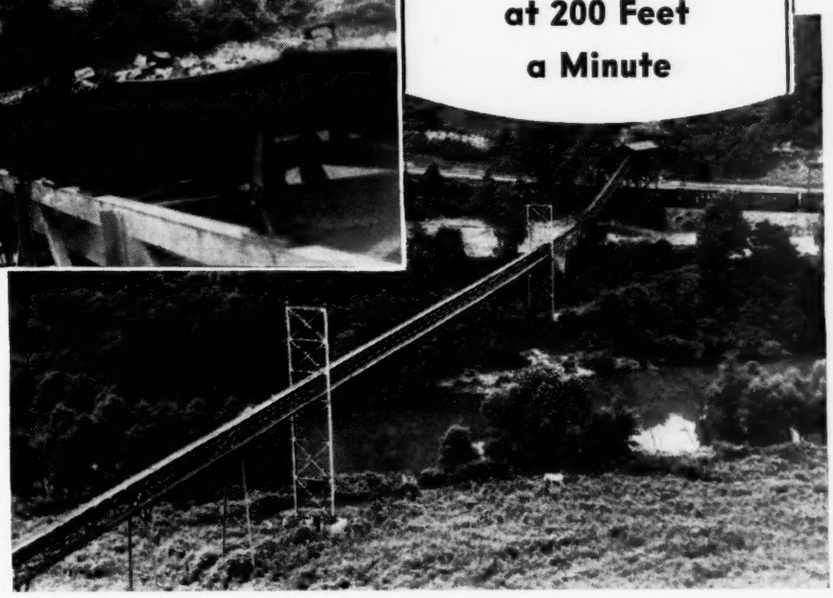
THE LUCKY FELLOW, HE HAS A RESERVATION AT THE HOTEL

Mayfair

EIGHTH AND ST. CHARLES STS.

Kentucky to West Virginia on a Continental Conveyor

200 Tons an Hour of Run-of-mine Coal Carried 680 Feet at 200 Feet a Minute



Continental Idlers

A complete line of Troughing, Flat Belt and Picking Table Idlers, Timken or SKF equipped, for belts 14 to 60 inches wide. Also a complete line of accessories, including Trippers, Pulleys, Take-ups, Drives, etc.

Write for Bulletin ID-105

When the Belfry Coal Company opened a new mine in Kentucky, they were faced with the problem of hauling the coal across the Tug River to the C & O Railroad in West Virginia. Many methods were considered, but it soon became apparent to company engineers that a belt conveyor carried on a suspension bridge was the most practical solution.

Continental engineers then designed the system pictured above on which run-of-mine coal is uniformly fed by an apron feeder onto the 36" belt conveyor—sped across the river at 200-FPM to the tipple on the opposite embankment.

This is typical of the manner in which Continental engineering is assisting industry in solving their materials handling problems.

Many industries are taking advantage of our present day stocks to build complete conveyors. Send us your orders or inquiries.

INDUSTRIAL DIVISION

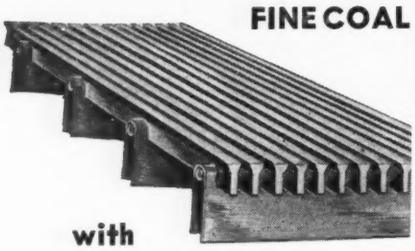
CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ATLANTA • DALLAS • MEMPHIS

INCREASE PRODUCTION LOWER MAINTENANCE

SIZING and DEWATERING FINE COAL



with

The Profile-Bar

WEDGE-BAR SCREEN

with

Continuous Slot Openings Enlarging Downward

WEDGE-BAR means continuous slots. No cross wires, loops or non - perforated areas. Downward enlarging slots draw moisture and undersize from screen surface. U - Holder supports mean maximum carrying capacity and rigidity, minimum weight.

WEDGE - BAR Sections are specially designed and fabricated to do your job and fit your equipment for the most efficient screen performance and longest life. Our data sheets are available for your convenience in supplying data we need to make our recommendations — without obligation on your part. Write us.

Shaker Jackets • Vibrating Screen Panels • Chutes • Conveyors • Dryers

WEDGE-BAR SCREEN CO.

145 Hudson St., New York 13, N. Y.

a valve user can pick out the valve he needs without thumbing through a whole catalog. Opposite the pictorial index chart is a detailed index showing what the valve can be used for and where to find its specifications in the catalog. Each valve has a four-digit type number that immediately indicates the design, applications and connections of the valve.

TURBINE PUMPS—Worthington Pump & Machinery Corp., Harrison, N. J. Bulletin H-450-B33 illustrates a few of the many services to which Worthington vertical turbine pumps may be applied. Originally designed and used for pumping from bored or drilled wells, they have within recent years, it is said, been applied to a wide variety of services in many industries.

CONVERSION FACTORS AND FORMULAS FOR ELECTRICAL ENGINEERS—I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa. Folder contains over 600 conversion factors commonly used by electrical engineers as well as definitions of basic electrical units, prefixes, mensuration and temperature conversion factors. The lists are arranged for use in a loose-leaf binder or for desk or wall mounting. Conveniently indexed, a wealth of electrical information is made instantly available. The factor tables have been lacquered to add durability.

BELTING—B. F. Goodrich Co., Akron, Ohio. New catalog Section 2100 features the company's leading transmission belting, Highflex. Details of the manufacturing and testing program for each foot of this belt are given, as well as its advantages in service. Highflex Jr., industrial and textile belting, and several other types of transmission belting are described, with tables listing stock sizes.

TUBE FURNACES—Burrell Technical Supply Co., 1936-42 Fifth Ave., Pittsburgh 19, Pa. Bulletin 459 describes the "unit package" tube furnace, which is said to be completely self-contained, with all requisite controls, and ready for service when plugged into an electrical circuit; all electrical equipment fitted to the maximum heating requirements of the furnace; all electrical controls and connections shielded and protected, but easily accessible by removing either the element guard or the side panel. Bulletin 201 tells about McDaniel combustion tubes fired for high-temperature furnaces.

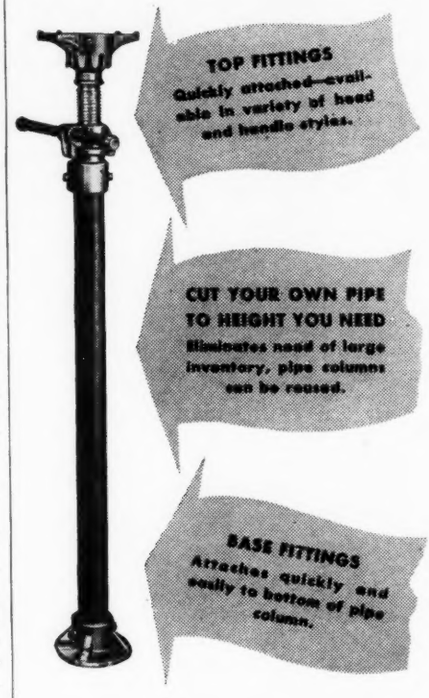
METALLIZING GUN—Metallizing Co. of America, 38-14 30th St., Long Island City 1, N. Y. Bulletin 49 covers the new Metco Type Y metallizing gun, giving a brief but detailed description of its new features—for heavy-duty continuous operation.

LUBRICATION—R. G. LeTourneau, Inc., Peoria, Ill. New wall chart, Form G-1067, 17x22 in., shows lubrication points on every piece of LeTourneau equipment, tells what kind of lubricant to use and how often. Stressing preventive maintenance, the chart is intended to help avoid prematurely worn-out parts and costly down time.

TRAILER—R. G. LeTourneau, Inc., Peoria, Ill. Folder Form TT-100 describes the Tournatruck—a flat-bed, big-tired trailer powered by a Tournapull—and points out how plans for variation in size and style of trailer bed provide different combinations

DUFF-NORTON MINE ROOF JACK FITTINGS

New, Economical Type Tailor-Made to Meet YOUR Needs


TOP FITTINGS
Quickly attached—available in variety of head and handle styles.
CUT YOUR OWN PIPE TO HEIGHT YOU NEED
Eliminates need of large inventory, pipe columns can be reused.
BASE FITTINGS
Attaches quickly and easily to bottom of pipe column.

Make your own adjustable roof jacks by attaching Duff-Norton Fittings to standard pipe cut to the length you need for your operations. You thus eliminate the need for large inventories of roof jacks, reduce costs, assure a dependable stock of roof jacks for all lengths required. Pipe columns and fittings can be used over and over.

Write for details on these cost-cutting Fittings and on the Standard Type Duff-Norton Mine Roof Jack.

THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.
Canadian Plant: COATICOOK, QUE. There is a Distributor Near You

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- **Whether your operation is in coal, metals or non-metallics . . .**
- **Whether it is machinery, equipment or supplies that you need . . .**
- **Whether you are specifying, requisitioning or buying . . .**

THE MINING CATALOGS gives you the information you need on the products of leading manufacturers; specifications, engineering services, performance data and "where to buy."

No need for weary search through a file-full of individual catalogs, many probably out of date. In *The Mining Catalogs* you have up-to-the-minute and complete data to help you. And *The Mining Catalogs* is the *only* consolidated catalog in the mining industries.

The 1945-1946 edition will soon be mailed. Send the coupon below to give us your name and company address to make sure you are included.

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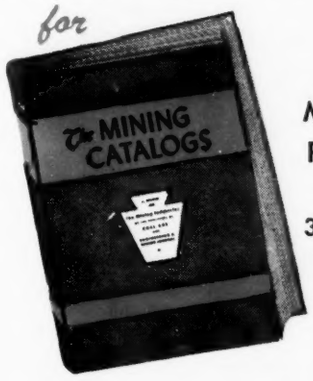

A McGRAW-HILL PUBLICATION

330 W. 42nd St.
New York 18,
N. Y.

THE MINING CATALOGS, 330 West 42nd St., New York 18, N. Y.

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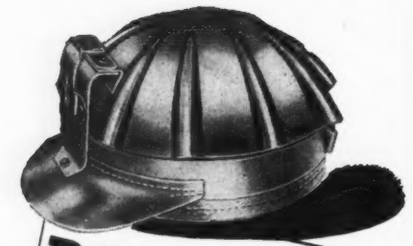
Name..... *Title*.....

Company Name.....

Company Address..... *State*.....

The nature of our operation is.....



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"Cool Caps"

FOR SUPERIOR HEAD PROTECTION

. . . Cool Caps for miners and Safety Hats for factory workmen, linemen and other exposed to head injuries. Molded, moisture-proof, fibre vulcanized to extreme strength and rigidity, yet thoroughly comfortable. Write for prices, complete catalog.

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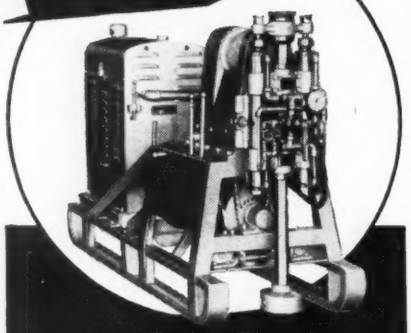
420 Blvd. of the Allies, Pittsburgh 19, Pa.

Diamond Core Drilling
CONTRACTORS



Testing mineral properties with our light gasoline drills. SATISFACTORY COAL CORES GUARANTEED. Ground solidification by our pre-pressure grouting method for shafts. We mine areas, horizontal holes for drainage. Electric drills for inside mine drilling.

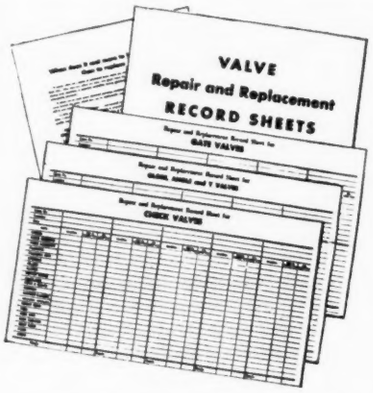
MOTT CORE DRILLING CO.
HUNTINGTON • WEST VIRGINIA

to meet specific requirements of each industry. Also shown is how Tournapull interchangeability gives a wide scope of usefulness by teaming the prime mover with Carryall Scrapers, Tournatrucks and Tournatrailers.

ELECTRODE PROPERTIES—Page Steel & Wire Division, American Chain & Cable Co., Inc., Bridgeport 2, Conn. Reference chart, 17x25½ in., gives the chemical and physical properties of Page welding electrodes and gas welding rods. Welding data are clearly condensed and arranged for easy fact finding. Though large, the chart will easily fold for filing in a desk drawer.

MOTORS — Crocker - Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J. Bulletin describes Sealedpower motor, developed for use in dusty locations, in places where there is excessive moisture, and for all applications where the conventional a.c. totally inclosed fan-cooled motor has been used in the past. It is available in sizes from 2 to 15 hp.

VALVE RECORD—Jenkins Bros., 80 White St., New York 13. Folder describes file folder and record sheets constituting a valuable project for a general reconversion check-up of valves to locate those that require repair or replacement and prevent in-



terruptions of operation and high maintenance expense. Designed to meet the general need for a simple, organized system, they provide a valve inspection and retirement plan, including instructions and model record sheets.

WELDING GUIDE—Page Steel & Wire Division, American Chain & Cable Co., Inc., Monessen, Pa. Booklet entitled "Guide to Everyday Welding" is offered as a guide in selecting the proper type of electrode or gas welding wire to use for welding various types of materials, structure and equipment. The information is arranged in easy-to-find tabular form, indexed by industries, listing types of jobs and equipment on which welding is used, showing character of welds and types of electrodes or gas welding rods for each application. A condensed chart is included that shows the physical properties, correct recommendations and analysis of weld metal deposit for stainless steel, carbon steel, shielded arc and bare and sub-coated electrodes and gas welding wires.

ARC - WELDING ELECTRODES — Wilson Welder & Metals Co., Inc., 60 East 42d St., New York 17. Catalog is designed to guide electrode users in selecting the right electrodes for any specific job; supplies complete data on the proper electrodes to be used for all types of work on a wide variety of base metals, and describes the approved welding procedures for each application. Electrodes are recommended for use on mild steel, alloy steels, low-alloy high-tensile steel and stainless steels. Additional sections are devoted to electrodes designed for nonferrous metals such as aluminum bronze, aluminum and manganese bronze. Chemical analyses, specifications, and other engineering data are supplied for each electrode.

ARC-WELDING ACCESSORIES—Air Reduction Sales Co., 60 East 42d St., New York 17. Booklet 130 illustrates and describes complete line of accessories for all types of arc-welding machines and operations. Types of equipment covered include electrode holders, graphite electrodes, welding cable, cable connectors and cable lugs. Also listed are welding helmets, goggles, face shields, headgear, aprons, gloves and sleeves. An additional section is devoted to Airco Heliwelding equipment developed in response to demands for a better method of welding magnesium.

USE OF FIRE EXTINGUISHERS—American-LaFrance-Foamite Corp., Elmira, N. Y. Instruction cards, explaining the operation and maintenance of four widely used types of hand fire extinguishers, cover the foam, soda-acid, vaporizing liquid and carbon-dioxide types. Illustrations show the various steps to be taken in handling, operating and maintaining the extinguishers.

ELECTRIC MOTORS—Star Electric Co., 200 Bloomfield Ave., Bloomfield, N. J. Catalog bulletin (printed in Spanish and Portuguese as well as English) presents specifications and descriptions of the company's standard motors and generators and describes facilities for building special motors. Illustrations show many typical applications in which severe service conditions are encountered. Specfications and load capacities are included for squirrel-cage induction motors of ½ to 200 hp.; wound-rotor induction motors of ½ to 200 hp.; d.c. motors of 1 to 800 hp., and design features of Star gear-motors and brakemotors.

Industrial Notes

IRON & STEEL PRODUCTS, INC., Chicago 33, has elected as vice president E. D. Connell, manager of the merchant iron and steel department.

HEWITT RUBBER CORP., Buffalo, N. Y., has appointed Gerald J. Slade as advertising manager, a new position created by the company's expansion and manufacture of new consumer products. For the last two years Mr. Slade has been with the B. F. Goodrich Co.

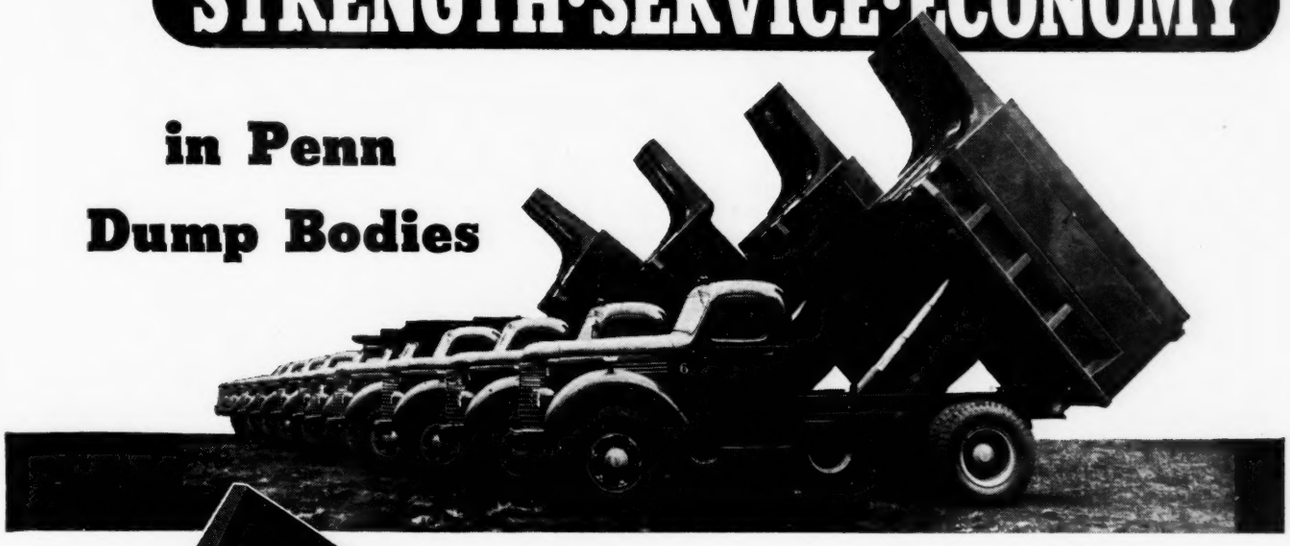
HERCULES STEEL PRODUCTS CO., Galion, Ohio, has appointed Carl G. A. Schmidt as manager of its new products division. He formerly served as equipment engineer for the Pennsylvania Department of Highways and was associated with various equipment manufacturers.

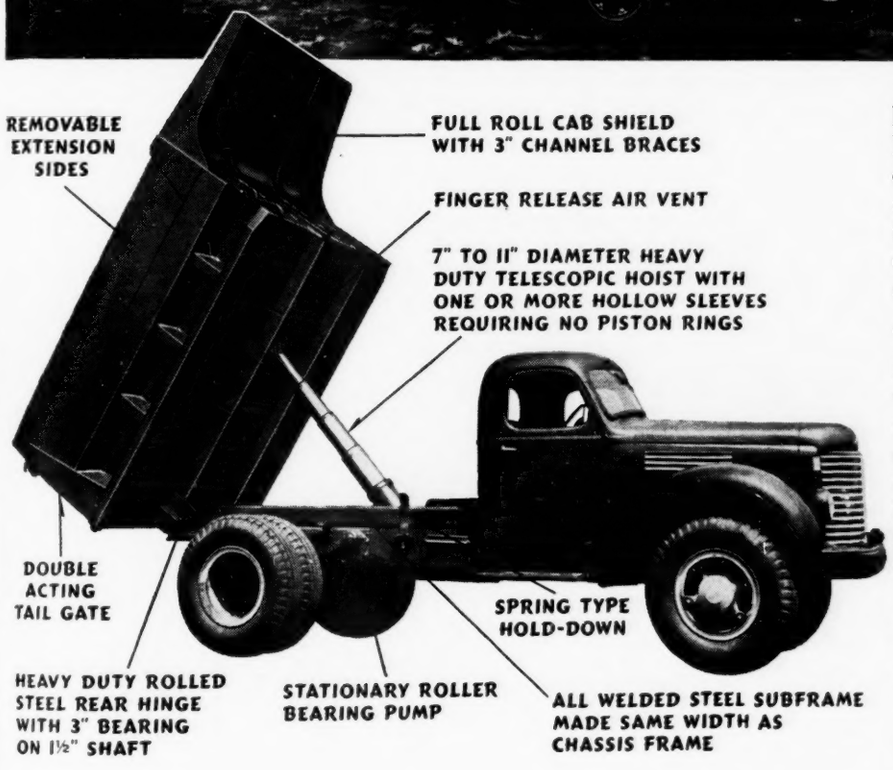
NORMA-HOFFMANN BEARINGS CORP., Stamford, Conn., has elected Harold J. Rit-

A Profitable Combination—

STRENGTH·SERVICE·ECONOMY

in Penn Dump Bodies




REMOVABLE EXTENSION SIDES
FULL ROLL CAB SHIELD WITH 3" CHANNEL BRACES
FINGER RELEASE AIR VENT
7" TO 11" DIAMETER HEAVY DUTY TELESCOPIC HOIST WITH ONE OR MORE HOLLOW SLEEVES REQUIRING NO PISTON RINGS
DOUBLE ACTING TAIL GATE
SPRING TYPE HOLD-DOWN
HEAVY DUTY ROLLED STEEL REAR HINGE WITH 3" BEARING ON 1½" SHAFT
STATIONARY ROLLER BEARING PUMP
ALL WELDED STEEL SUBFRAME MADE SAME WIDTH AS CHASSIS FRAME

Penn Telescopic Hoists—used on all Penn Dump Bodies—are lighter in weight than any other hoists of equal lifting capacity. The lifting power is applied direct to the body without the use of rollers, arms, levers or cams—no small piston rods and lifting mechanism to wear, bend or twist with the load. Therefore, less working parts, less weight, and lower upkeep.

The hoist cylinder or jack is mounted as near upright as possible to apply the lifting force at the most advantageous point to relieve the chassis frame of undue strain. Pumps are heavy duty roller bearing design with heavy bronze face plates. Capacity is twenty gallons per minute for fast dumping.

Built-in strength is a basic feature of Penn Dump Bodies. They are fabricated of high resistant steel sheets, arc-welded to a body sub-frame to form a rigid unit. Tailgate and all other body hardware are of forged steel which eliminates breakage.

They are designed for all kinds of rugged service—coal stripping duty, with bodies readily convertible for road and general dump work; for excavating and rock hauling with extra duty bodies made in any length, width and capacity desired; for sand, gravel, garbage or any other kind of haulage and dumping.

Penn Dump Bodies are economical because of their sturdy construction, their adaptability, and their long life of trouble-free performance.

Built to standard and special types for light and heavy duty to suit your purpose—and for any type of chassis.

See your truck dealer, or write for illustrated literature and details.

HOCKENSMITH WHEEL & MINE CAR CO.
Established 1877, Penn, Pa., Phone Jeannette 700

PENN BODY DIVISION

Hockensmith

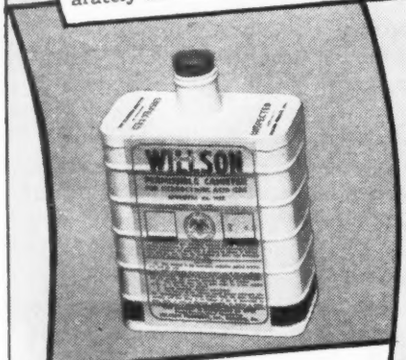
WHEEL & MINE CAR CO.

Since 1877

Also manufacturers of Oilspok Wheels, mine and industrial cars.

Approved For Protection Against Industrial Gases

Give your workers reliable lung protection with Willson Industrial Gas Masks. Approved by U. S. Bureau of Mines. Seven different styles guard against specific hazards. Examples: ammonia, chlorine — other acid gases and organic vapors (separately and in combination).



Each style has its own special canister. Carefully tested for filtering efficiency, absorption quality. Other Willson features: non-fogging lenses, permitting unobstructed all-direction vision; snug-fitting all-rubber face piece.

For help with your lung protection problems, get in touch with your Willson distributor or write for further information.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

Established 1870

239 WASHINGTON STREET • READING, PA., U.S.A.

ter as president, treasurer and a member of the board of directors, vice O. P. Wilson, who had resigned.

American Brake Shoe Co. has appointed Joseph B. Terbell as executive vice president of the American Manganese Steel Division.

Westinghouse Electric Corp., Motor Division, East Pittsburgh, Pa., expects to expand its monthly driving force of 200,000 hp. to perhaps 300,000 hp. when operations reach full swing in the new plant at Buffalo. About 6,000 persons will be employed there compared to the 4,000 now in motor production in the parent plant. Motor production will run more than 80 percent higher than in the peacetime years of 1937-39 and about 50 percent above the peak year of 1940, according to estimates by company officials.

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, has appointed as manager of the Indianapolis branch Forrest G. Wilson, formerly a salesman at the Dallas branch. H. F. Zahn, formerly manager of the Atlanta branch, has been made manager of the Philadelphia branch. C. G. Jackson, formerly manager of the Boston branch, has been transferred to Atlanta as manager. J. K. Miller, heretofore a New York branch salesman, has taken over management of the Boston branch.

Iron Fireman Mfg. Co. has appointed A. M. Stephenson and A. Bayes Jordan as district representatives in southern territory. Mr. Stephenson, an engineer in the Cleveland service department since early 1942, has headquarters in Charlotte, N. C. Mr. Jordan has headquarters in Cleveland, Tenn., having taken the place of S. W. Alford, who has been promoted to district sales manager.

Diesel Manufacturers Association, Chicago, has elected as president E. J. Schwanhausser, vice president, Worthington Pump & Machinery Corp. Vice presidents are Gordon Lefebvre, president, Cooper-Bessemer Corp., and J. E. Peterson, vice president, General Machinery Corp. Re-elected as treasurer was Robert H. Morse Jr., vice president and general sales manager, Fairbanks, Morse & Co. Executive Director Harvey T. Hill also was reelected.

American Brake Shoe Co. has appointed as vice president of the Brake Shoe and Castings Division Horace A. Deane, works manager of the division. He is in charge of operations in 18 of the company's 57 plants.

J. V. Hammond Co., Spangler, Pa., has more than doubled the size of its plant, according to J. V. Hammond, president. The safety box department has been more than doubled in size. The company manufactures tamping poles, shotfiring units, wooden mallet and wedge sets, explosives boxes, trolley poles, sounding sticks, mine rollers, insulation boxes and brake blocks—all wooden safety equipment for the mining industry, which it has been serving since 1924.

Gar Wood Industries, Inc., Detroit has promoted W. H. Hammond to the newly created post of vice president in charge of sales. Joining the Philadelphia branch in 1921 as a bookkeeper, he has lately been sales manager of the hoist and body and tank divisions only and director of branches with the title of vice president. George D. Shaeffer, formerly chief engineer, has been elected vice president in charge of engineering, after seven years' service with the company.

Roberts & Schaefer Co. Chicago, has a new Pittsburgh office address. Under the direction of R. T. Middleton, vice president, business will be conducted from 2221 Oliver Building.

Economy Pumps, Inc., Hamilton, Ohio, has appointed E. E. Baker as manager of distributor sales division.

Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J., announces that its Pittsburgh branch has been expanded to include a large part of Ohio, the eastern Panhandle of West Virginia and several northern counties of Maryland, and henceforth will be known as the central district, with R. C. Rice as manager. J. B. Anderson assistant manager, succeeds the late Stanley J. Waechter.

Caterpillar Tractor Co., Peoria, Ill., has named R. R. Robinson as assistant chief engineer in charge of engine design.

Chrysler Corp., Airtemp Division, has appointed H. A. Malcom, formerly assistant general sales manager, to the position of general sales manager.

Ajax Flexible Coupling Co., Inc.,

★ OVER-SIZED, PRESS-FORMED U-BOLT

STRONG!

You won't find a stronger clip. It's first choice for men who must depend on safe wire rope fastenings! A product of the American Hoist & Derrick Co., St. Paul 1, Minnesota.

CROSBY CLIPS

RIGHT ANGLE LOADING

Plus staggered rollers that will not "TRACK"...

ROLLWAY

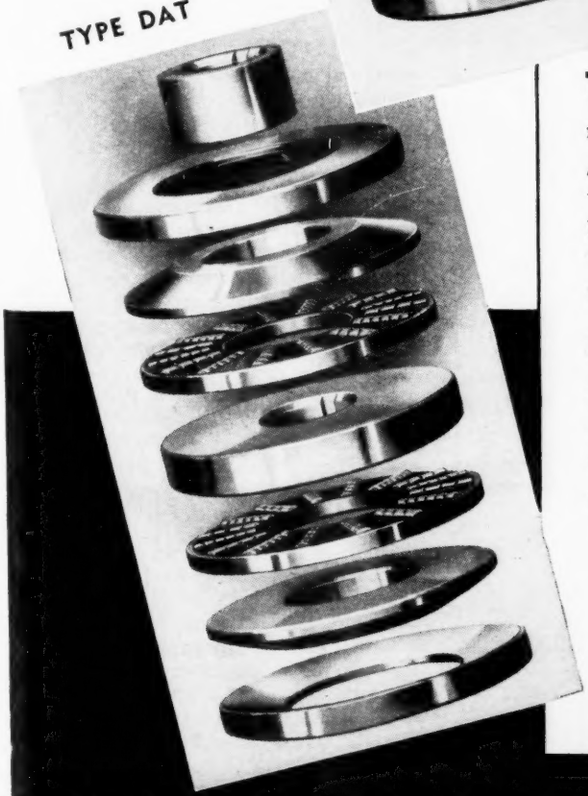
Solid-cylindrical-roller

THRUST BEARINGS

TYPE T

TYPE AT

TYPE DAT



When thrust loads are heavy . . . when maximum bearing capacity in minimum space is required . . . when the aim is to design "preventive maintenance" into the mechanism itself . . . Rollway solid cylindrical roller Thrust Bearings offer sound solutions to the basic problems. Here are the reasons why:

1. Rollway carries all loads at right angles to the roller axes.

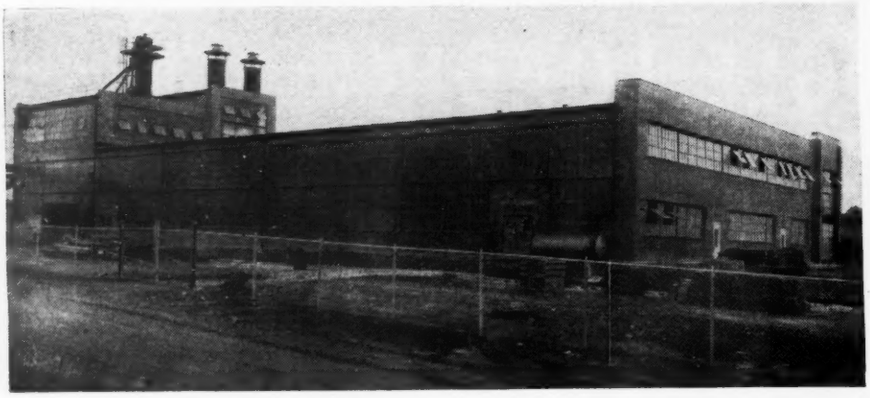
2. Rollway solid-cylindrical rollers—staggered in position and varied in length, so as to cancel out "tracking"—are accurately spaced in machined-bronze retainers.

3. Thrust plates, held to extremely close limits of parallelism, afford a linear contact with the straight cylindrical rollers, doing away with Brinell effect and roller "pinch outs" with its consequent roller-end wear and rubbing friction.

Six basic types in many sizes to choose from. Send a print or detailed description for free bearing recommendation.

ROLLWAY BEARING CO., INC.
SYRACUSE 4, N. Y.

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Youngstown • Cleveland • Detroit • Chicago • St. Paul • Houston • Tulsa • Los Angeles



Westfield, N. Y., has appointed R. R. Bauman as its Chicago area sales representative at 407 South Dearborn St.

McNALLY-PITTSBURG MFG. CORP., Pittsburg, Kan., has built a new, completely mechanized, modern foundry, where gray iron castings and alloy iron castings will be produced.

NATIONAL MALLEABLE & STEEL CASTINGS Co. has elected as vice president in charge of sales Wilson H. Moriarty, lately assistant to the president. James A. Slater, vice president in charge of railway sales, has retired after a career of 48 years with the company.

B. F. GOODRICH CHEMICAL Co., Cleveland, has acquired the assets of the Hycar Chemical Co., producer of Nitril oil-resistant types of synthetic rubber. Physical assets and trade names of Hycar are now owned by Goodrich and all Hycar products will be marketed by the new owner. Production will continue in the company's plant in Akron.

HERCULES POWDER Co., Wilmington, Del., announces the retirement Jan. 1 of Joseph S. Marx, superintendent of the Carthage (Mo.) explosives plant, after 45 years in the explosives industry, 30 years with Hercules. He is succeeded by John C. Foster, who arrived at the plant Nov. 1, after more than three years as smokeless powder superintendent at the Hercules-operated Badger Ordnance Works in Wisconsin.

ALLEGHENY LUDLUM STEEL CORP. will rank development work on new applications of stainless steel and other alloy steel products high on its postwar program. Concurrently with the formation of a sales development department, to integrate and intensify product application and new development activities, the company has appointed W. B. Pierce to head the department. A staff of technically trained engineers will assist manufacturers in solving problems involving applications of stainless steel and related alloys. The company will expand its line of magnet steels to include all types of "hard" and "soft" magnets, magnetic and non-magnetic alloy steels by acquiring the Arnold Engineering Co. on Jan. 2, 1946. Max J. Pischke, formerly Pittsburgh district sales manager has been promoted to manager of warehouse sales.

INTERNATIONAL HARVESTER Co., Chicago, has purchased a new factory with about 135 acres of land and modern manufacturing and office buildings having about 2,000,000 sq.ft. of floor area at Melrose Park, Ill., a suburb of Chicago. To be known as the Melrose Park Works, it formerly was operated by the Buick Division of General Motors in the manufacture of Pratt & Whitney aircraft engines. The new plant will be used primarily in producing the current line of diesel engines, one current size of gasoline engine, two new larger diesel engines and a new large crawler tractor.

TIMKEN ROLLER BEARING Co. has named as division manager for all divisions of the company in Cincinnati Fred Reiser Jr., heretofore district manager there for the industrial division. Joining the company in 1933 in the industrial engineering department, he was sent to Pittsburgh in 1935 as a sales engineer and was transferred to Cincinnati in 1941. Harry McCool, who joined the company in 1928 as a hot-mill operator, has been appointed sales engineer for the steel and tube division in the Cincinnati district.

PROFESSIONAL SERVICES

ALLEN & GARCIA CO.
ENGINEERS AND BUILDERS OF MODERN COAL OPERATION
Authoritative Valuations, and Reports of Mining Properties Equipment and Operation.
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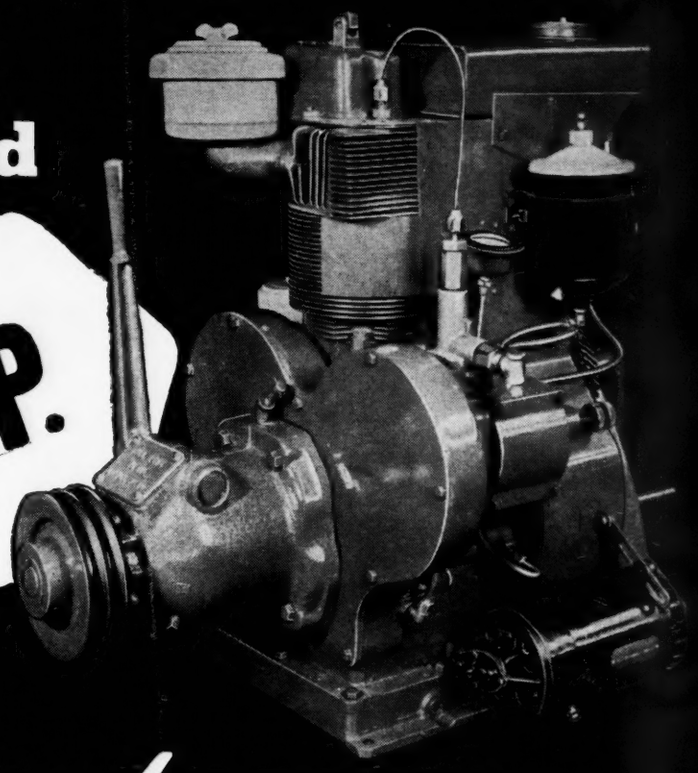
CONSULT THESE SPECIALISTS:
Let them save your time by bringing their broad experience in their specialty to bear on your problems.

MEET THE BANTAMWEIGHT OF THE HEAVYWEIGHTS!

The New Air-Cooled 3¾ H.P.



Sheppard DIESEL

For the first time, Diesel economy and dependability are available in a small engine.

The new Model 14 Sheppard Diesel is not only the smallest Diesel (both in size and H.P. rating) ever built for commercial use... but it's also the *only* stationary Diesel that is *air-cooled.*

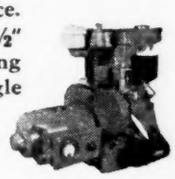
This absence of a liquid cooling system reduces the size and weight of the unit... and, more important, the time required for servicing and maintenance.

Overall the engine stands 28½" high, 20¾" wide, 22½" long with crank removed. It is a single cylinder, 4-cycle Diesel... developing 3¾ continuous horsepower* at 1800 R.P.M. Standard equipment includes both hand and 12-volt electric starting. The engine—including power take-off and clutch—is complete, ready to operate, when shipped from the factory.

An indication of its economical operation is its fuel tank—it holds 9/10 of a gallon!

The Sheppard Model 14 is ideal for powering communication systems, auxiliary or standby lighting plants, pumps, conveyors and other power-driven equipment that requires a steady, dependable power source.

If you need a small engine you can install and forget—the new 3¾ H.P. air-cooled Sheppard Diesel is the one to remember. For complete information about this revolutionary new engine—mail the coupon today.



Available direct-connected to a 2 KW generator.

POWER UNITS, 3¾ to 56 HP • GENERATING SETS, 2 to 36 KW

R. H. Sheppard Company
111 Middle Street, Hanover, Pa.

Please send complete information about the new air-cooled Sheppard Diesel Power Unit ☐ Generating Set ☐.

Name----------

Company----------

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DIESEL'S THE POWER... Sheppard's THE DIESEL!

WHY SO MANY Simplex JACKS IN COAL MINES?

Simplex Ratchet Lowering Jack in use by cutting machine crew in Louise mine of Louise Coal Co.

Simplex General Purpose Mine Jacks

A size for seams of any thickness:

84A, 14" high, 7" lift

85A, 17" high, 10" lift

86A, 20" high, 13" lift

5-tons capacity. Toe lift on all sizes. Lift from a minimum height of 1¾". Other Simplex Ratchet Lowering Jacks in 10, 15 and 20-ton capacities.

There are definite reasons for the large number of Simplex Jacks underground.

Simplex Jacks are preferred primarily because they provide the fullest measure of safety. They are designed and built that way. The Simplex General Purpose Mine Jacks pictured embody the following safety features: double lever sockets, stronger cadmium plated springs and links, shorter fulcrum centers, longer and wider concave rack bar toe lifts, larger trunnion bearings, larger and stronger pawls, reinforced inner-ribbed housings and greater inbuilt strength.

These Simplex Jacks are fast operating and always efficient. They speed the handling of mechanical equipment and definitely help get out greater tonnages. They are standard for use with coal cutting and loading machines, re-railing mine cars and light locomotives, mine trackwork and for lifting and moving all types of mechanical equipment.

Send for Bulletin "Mines-41" showing mine roof jacks, roof timber elevating jacks, post-pulling jacks and other mine jacks.

TEMPLETON, KENLY & CO.,

CHICAGO (44), ILLINOIS

Better, Safer Jacks Since 1899

Simplex

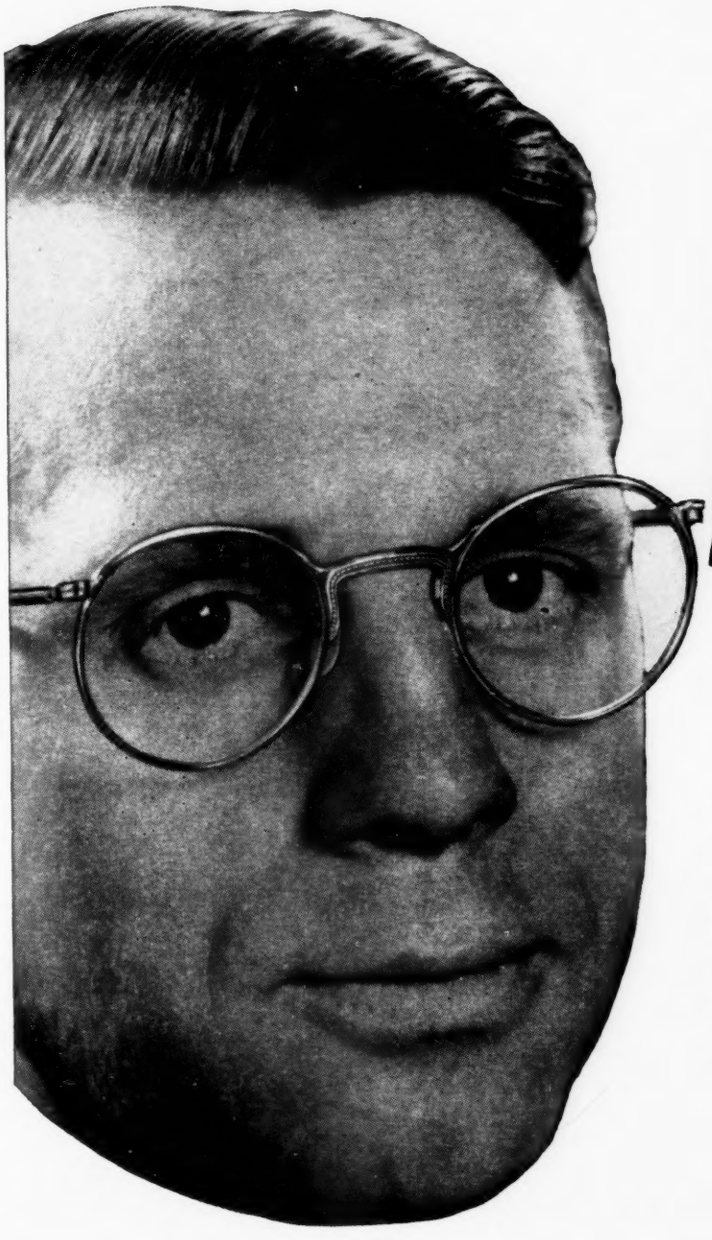
LEVER · SCREW · HYDRAULIC

Jacks

3 Good Reasons

FOR CHOOSING

AO Ful-Vue SAFETY GOGGLES



Dependable Protection

Genuine Comfort

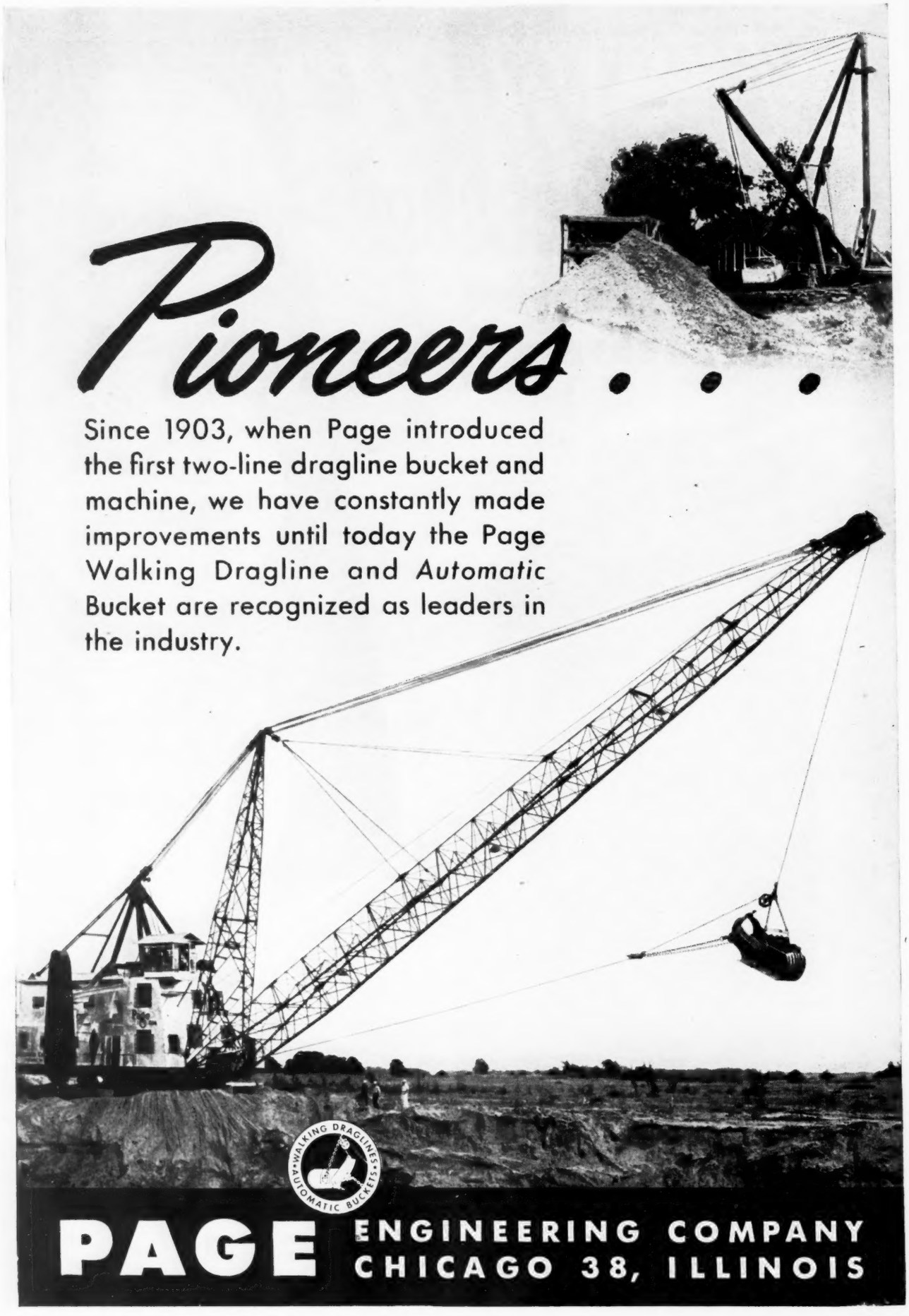
Good Looking

For efficient eye protection with maximum comfort, choose AO Ful-Vue Safety Goggles. These good-looking goggles provide all-angle vision—are shaped to conform to the orbit of the eye, thus bringing the lenses closer to the face, and leaving *no* unprotected areas around the bridge of the nose. Sturdy, double-braced bridge insures long life in strenuous service. Earpieces have perspiration-proof insulation.

Made in three eye sizes and three bridge sizes, with 6 Curve Super Armorplate Clear or Calobar lenses —with or without side-shields. Your nearest MSA Representative can supply you.

American Optical
COMPANY

SOUTHBRIDGE, MASSACHUSETTS
Safety Division


Pioneers . . .
Since 1903, when Page introduced the first two-line dragline bucket and machine, we have constantly made improvements until today the Page Walking Dragline and *Automatic* Bucket are recognized as leaders in the industry.
WALKING DRAGLINES • AUTOMATIC BUCKETS •
PAGE ENGINEERING COMPANY
CHICAGO 38, ILLINOIS

LET DE LAVAL HELP YOU SELECT THE *correct* WORM GEAR

Too large a worm gear is unnecessarily expensive; too small a gear invites failure. Correct selection depends not only upon transmitted horsepower and ratio of reduction but also upon continuity of operation, shock and other load characteristics. The recommendations of the De Laval representative assure you of the right drive at the right price. He is backed by Home Office engineering experience, gained in furnishing worm gear drives for all classes of service over the last twenty years.

Specifications alone do not make a worm gear

1144

TURBINES • HELICAL GEARS and WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

WORM GEAR DIVISION

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • HELENA • HONOLULU • HOUSTON KANSAS CITY • LOS ANGELES • MANILA MONTREAL • NEW HAVEN • NEW ORLEANS NEW YORK • PHILADELPHIA • PITTSBURGH ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE • TORONTO • TULSA VANCOUVER • WASHINGTON, D. C. • WINNIPEG And Cities in Central and South America

Long, ECONOMICAL BELT SERVICE REDUCES PER-TON COSTS

REPUBLIC'S heavy duty conveyor belting, Super Excelo Reprene, will give long service under abusive operating conditions. It is built to handle heavy loads and large lumps of coal or rock —and to do it year after year. Super Excelo Reprene is constructed with oil-and-heat-resisting synthetic rubber compounds, selected to withstand abrasion, cutting, tearing, flexing and aging. Specify Super Excelo Reprene Belting where operating conditions are severe—room conveyors, mother belts, slope conveyors, cleaning plant and refuse conveyors. Consult your nearby Republic Distributor.

WE ARE PARTICIPANTS IN THE OWNERSHIP AND OPERATION OF NATIONAL SYNTHETIC RUBBER CORPORATION

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LEE DELUXE TIRES AND TUBES
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STOODY HARD-FACING ALLOYS

Lengthen the Service Life of Vital Equipment

AN APPLICATION of these wear-resistant alloys will result in a definitely longer life for equipment subject to wear and abrasion. Among the most popular Stoody alloys are:

Stoody No. 6 — for oxyacetylene use only, retains its hardness and wear resistance even at red heat. Cold hardness-Rockwell C 42-44, with high ductility . . . Withstands shock and impact without chipping, scaling or developing surface cracks.

Stoody No. 1 — Similar to No. 6 but cold hardness. Rockwell C 53-55 has greater hardness with less ductility and toughness.

Stoodite — a cast alloy steel rod which, when welded on to steel, provides an exceptionally hard, wear-resisting surface. Non-magnetic. Hardness Rockwell C 56 to 60.

Stoody Self-Hardening Rod — low-priced. abrasive-resisting, fabricated of steel strip and carefully selected alloys. Deposit is very tough and will test Rockwell C 50-54. Can be forged without loss of hardness.

Nationwide Airco offices offer a complete line of Stoody Hard-Facing Alloys to cover every variety of hard-facing application. For complete details, call or write your nearest Airco office.

Save Buying Time

Send for your FREE copy of Catalog No. 40. It gives full details on Airco's comprehensive line of gas welding supplies. Address your nearest Airco office or write to Dept. EN at the New York office.

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Represented Internationally by Airco Export Corporation

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Everything for gas welding and cutting

PRODUCTION *for* PEACE

A year of remarkable history has just passed, in which the normal routine way of living for most every individual in many countries of the world, was disturbed. Citizens everywhere were devoting their energies to war . . . to destroy, instead of to build.

INDUSTRIAL RUBBER PRODUCTS that Quaker is making NOW for civilian use

(PARTIAL LIST ONLY)

- Transmission Belting
- Agricultural Belting
- Conveyor Belting
- Elevator Belting
- Air Drill Hose
- Chemical Hose
- Creamery Hose
- Fire Hose
- Fuel Oil Hose
- Garden Hose
- Gasoline Hose
- Tank Car and Tank Truck Hose
- Sand Blast Hose
- Spray Hose
- Steam Hose
- Suction Hose
- Oil Suction and Discharge Hose
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- Welding Hose
- Tubing
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- Pump Valves
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. . . *and* NOW *it is* 1946

1946 starts out with a fresh inspiration to guide us in peacetime endeavors. Quaker had no reconversion problem. The products of Industrial Rubber Goods which we manufacture are very similar, whether used for war industries or for peace industries. The paper work on cancellations of Government orders is just about completed. Full scale production on civilian orders started August 17 and has been going on steadily ever since.

Naturally we are making headway on our Backlog of orders. It still will be several months before critical raw materials will be available in quantities wanted. But we are making better deliveries on many items, especially on Fire Hose, Mill Hose and in Wrapped Construction Hose in sizes 3″ and larger.

Our suggestion to the keen buyers, with an eye on the future, is to place their orders well in advance of requirements. This will insure getting your merchandise when desired.

Anticipate your needs on Industrial Rubber Products and send your orders to Quaker NOW.

"If there is a way to get it done—Quaker will do it"

QUAKER RUBBER CORPORATION

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Western Territory: **QUAKER PACIFIC RUBBER COMPANY**

SAN FRANCISCO 5 • LOS ANGELES 21

HYDROTARDER EQUIPPED TRUCKS Make 25% More Trips

BEING able to descend the steepest grades under perfect control without using the mechanical brakes or low gear enables a Hydrotarder-equipped truck to make five round trips in the time normally required for four. One operator reports that this additional hauling capacity of his trucks paid for his Hydrotarders in only seven months. When savings on brake and engine maintenance are included, the Hydrotarder paid for itself in only five months.

If you are operating trucks in hilly country or on off-the-road jobs, let us tell you how Hydrotarder can lick your braking problems while safely speeding up truck operations.

HYDROTARDER SOON PAYS FOR ITSELF BY THESE SAVINGS

They are based on results achieved by scores of Hydrotarder-equipped trucks.

25% SAVING IN TIRES
8% SAVING IN FUEL
85% SAVING IN FRICTION BRAKES
25% SAVING IN TIME

Parkersburg HYDROTARDER

THE PARKERSBURG RIG & REEL COMPANY
PARKERSBURG, W VA.

Manufacturers since 1931 of the famed Hydromatic Brake—the load retarder which makes possible the drilling of deep oil wells safely and economically. Its counterpart, the Hydrotarder, enables motor transportation to operate with greater safety, economy, and speed than was ever heretofore believed possible.

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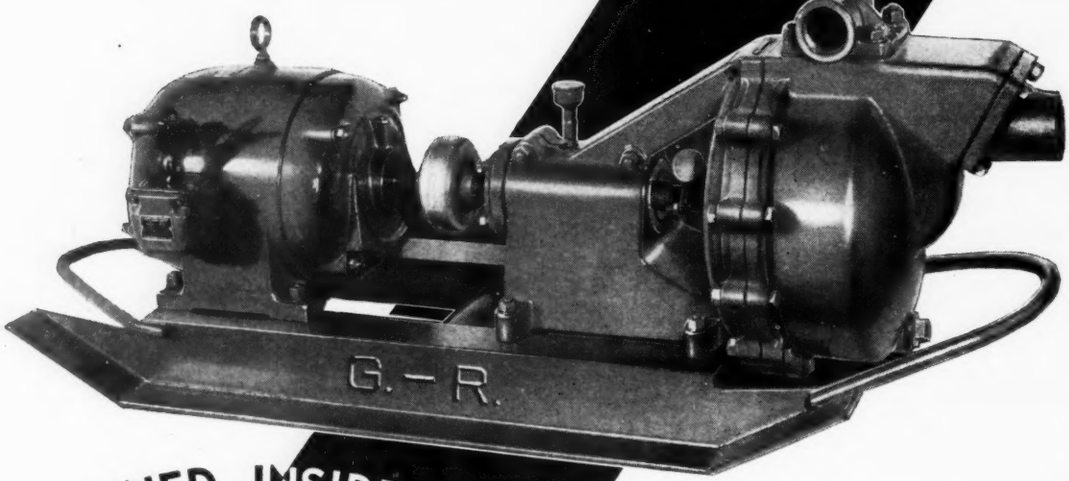
YOU NEVER BEFORE GOT ALL THIS IN A DRAINAGE PUMP



STREAMLINED INSIDE WHERE STREAMLINING COUNTS

GORMAN-RUPP PUMPS
ARMY NAVY
UNSURPASSED FOR PUMPING FAST

Operate this Gorman-Rupp pump for months at a time, without rest, if you wish. It's built for that kind of job. Or give it intermittent service, either automatic or remote controlled. Its complete self-priming makes this easy. Start, run and stop, it requires no attention.

Gorman-Rupp self-priming centrifugal pumps for mine service are the simplest made. There is only one moving part, the impeller. This turns at motor speed to eliminate reduction gears and other wearing parts. No valves or by-passes are used to establish a prime and, the rest of the time, decrease efficiency. These pumps will handle any size solid that will pass the intake strainer, without clogging or damaging the mechanism.

When repair or maintenance becomes necessary, this may be done by unskilled labor with common shop tools and with complete assurance of a satisfactory job. Parts subject to eventual wear and corrosion are easily accessible.

Various sizes of Gorman-Rupp mine gathering pumps may be had in capacities from 4,500 to 15,000 gallons per hour and heads up to 125 feet. These models are described in bulletin MP-2. Write for a copy and see what you can really get in pump value.

CAPACITY HEAD TABLE IN GALLONS PER HOUR

Total Head Feet	20	40	60	80
MODEL 40-40	6900	3900		
MODEL 60-60	9600	7500	4200	
MODEL 60-100	10800	9600	8100	6300
MODEL 125-100	13200	12600	11400	9000

THE GORMAN-RUPP COMPANY

M A N S F I E L D • O H I O

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FOR OVER 75 YEARS A MARK OF QUALITY

1946

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LIMA LOCOMOTIVE WORKS INCORPORATED
SHOVEL AND CRANE DIVISION, LIMA, OHIO

SHOVELS - CRANES - DRAGLINES

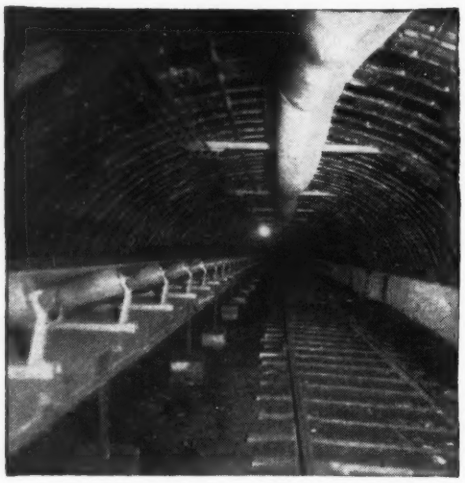
Capacities

SHOVELS
¾ Yd. to 5 Yds.

CRANES
13 Tons to 100 Tons

DRAGLINES
Variable

How to Build a Sloped Entry *the Quick, Safe Way*



Mine slope in Indiana built of 5-gage ARMCO Tunnel Liner Plates. The span is 17 ft. Maximum height of overburden is 100 ft.

Construction of sloped mine entries has been simplified and speeded by the use of ARMCO Tunnel Liner Plates. The opening may be arch-shaped, with a span of 14 to 18 feet—sufficiently wide for a belt conveyor and an industrial track. Or the use of two circular pipes—one for the belt conveyor and one for the track or for air—has the advantage of requiring no footings.

The plates go together quickly. One man easily handles the strong, light-weight steel sections, bolting them together with regular wrenches. Work moves fast and costs are low.

Write for pictures and data on ARMCO **tunneling** methods. Armco Drainage & Metal Products, **Inc., and** Associated Companies, Middletown, Ohio.

ARMCO Tunnel Liner Plates

ARMCO

DON'T THROW AWAY BROKEN PARTS—

Repair-Weld Cast Iron with

P&H "HARCAST"

You can make immediate repairs — save time — save money — keep equipment on the job longer with welding. No matter what the metal, there's a P&H electrode to weld it properly.

For example P&H HARCAST welds cast iron to cast iron as well as cast iron to steel. If you haven't used this new electrode for weld-repairing your broken cast iron parts — write us today for a trial sample.

In fact, we can help you no matter what your weld repairing problems might be. Ask about the complete line of electrodes for hard facing against impact and abrasion.

Don't Delay — See your P&H representative or write for full information!

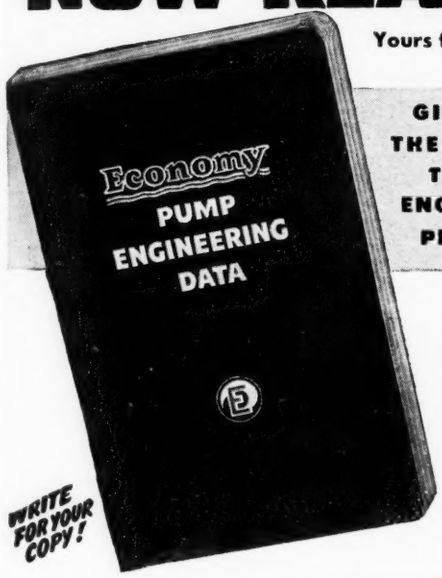
General Offices; 4540 W. National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

NOW READY

Yours for the asking



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A timely contribution to industry—416 pages of factual data just when vital post-war pump problems require authentic facts, sound experience and advanced engineering practice.

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Here, under one cover, are hundreds of handy tables and diagrams you need every day. Revised, improved and new data governing the correct layout and installation of sewage, drainage, processing, heating systems, etc. Describes clearly and exactly the way to do the job right.

Indespensable to Engineers, Plant Managers, Maintenance Men, etc. Sent free to Executives in response to their requests on business letterheads. Otherwise, $2 per copy.

ECONOMY PUMPS, INC.

HAMILTON, OHIO • U. S. A.

Every mine operator knows that easy maintenance and the ability to replace parts quickly are of utmost importance in the selection of Sand Drying Stoves. The SUTTON Sand Drying Stove offers those advantages in a big way! This unit requires little or no attention for operation and unskilled labor can use the stove to its fullest capacity. Its efficiency has been proved in actual use all over the world for more than 40 years.

To demonstrate how easily you can replace parts on SUTTON Dryers we have pictured here the component parts—all of which are available for immediate delivery. To order you merely name the part and identify the stove by the number on its door.

SUTTON
Sand Drying Stoves

1. Skirting
2. Dome
4. Top Ring
5. Door Barrel
6. & 7. Fuel Chute with Fire Door
7. Fire Door Only
8. Perforated Ring
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18. Long Sections only of external Gratings
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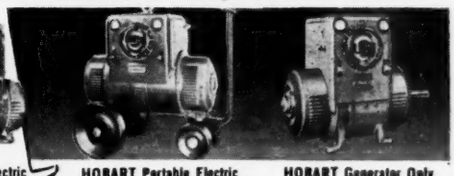

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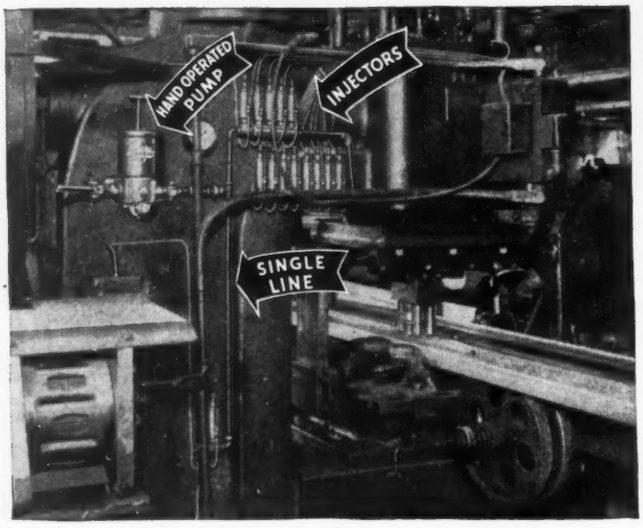

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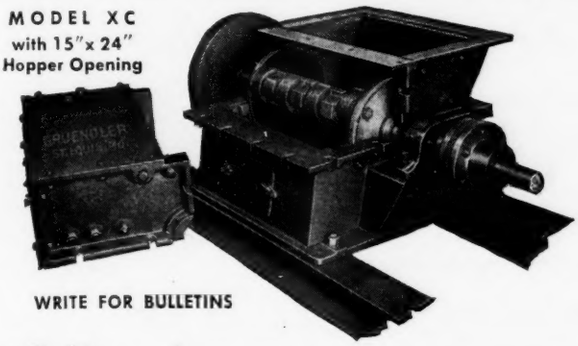

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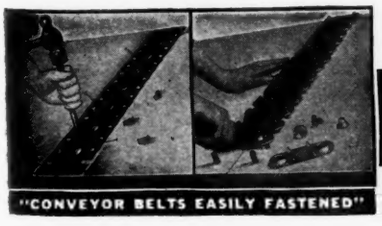

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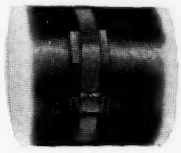

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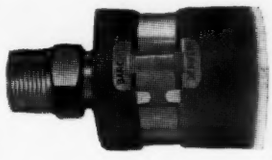

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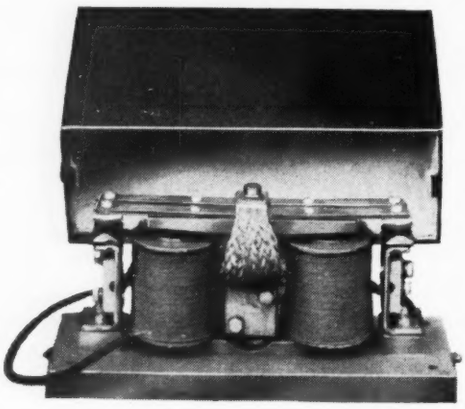

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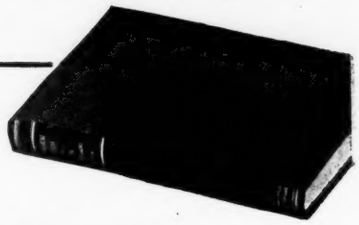

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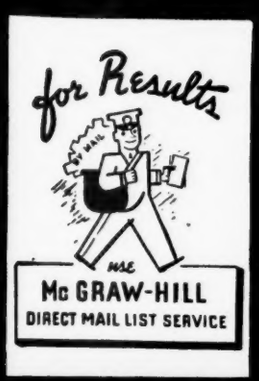

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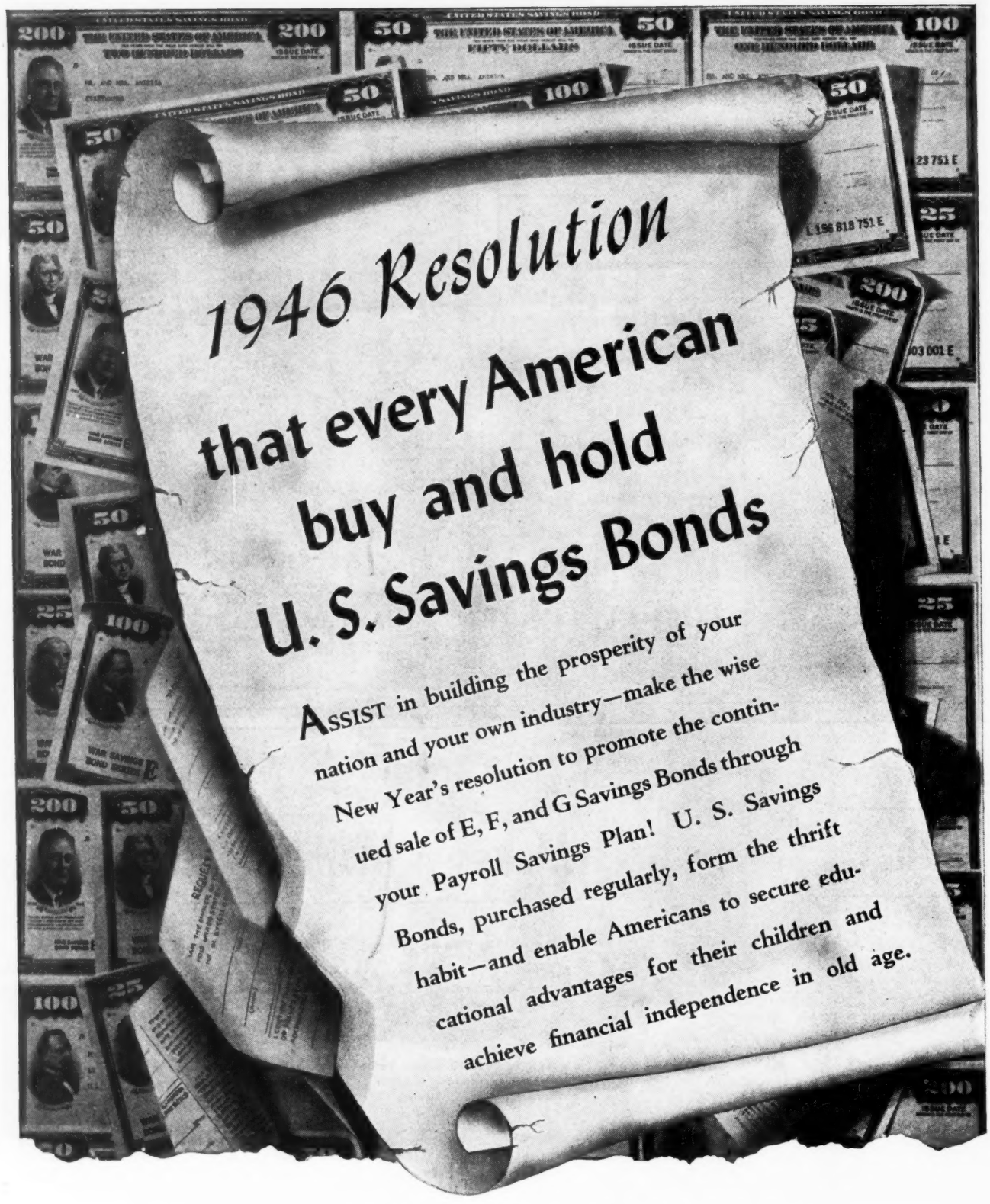
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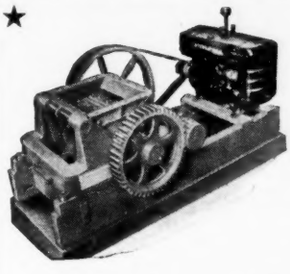

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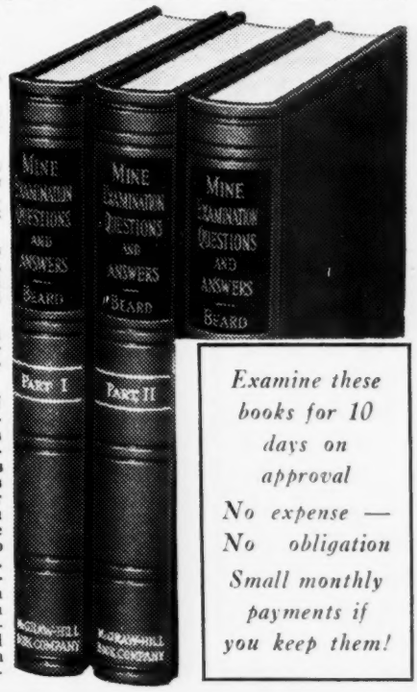

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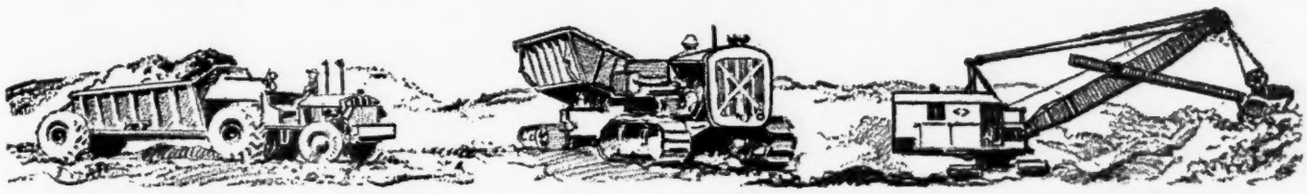

About "Pay-As-You-Go" Plan

Why not let that new stripping job *pay its own way?*

No need to pay out a lot of cash for equipment. ECONOMY COMPANY can ship you Draglines, Shovels, (big sizes for stripping and smaller units for loading) also all kinds of hauling equipment, including Trucks, Trailers and Tractors—everything you may need to cover a job—large or small.

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SHOVELS

⅜ yd. Bucyrus-Erie 10B Shovel.
⅜ yd. Linkbelt Speeder Model LS-40—rebuilt and guaranteed. If you need a good little machine this is a real buy.
⅜ yd. 1939 or 1940 Insley K-10 Shovel.
½ yd. 1941 Insley K-12 Backhoe and Dragline combination.
¼ yd. Wilford Shovel. Standard shovel front and dipper stick.
22' Boom. Completely overhauled.
⅜ yd. Fundum Shovel—¾ swing—⅜ yd. dipper. Good condition.
⅜ yd. Hanson Dragline Model 33. Age 4½ yrs. 30' Boom. Page Bucket. Condition good.
⅜ yd. Hanson Shovel—Chain Crowd. Fairly good condition.
⅜ yd. Universal Shovel Model B. Condition good.
⅜ yd. Universal—¾ swing. Condition good.
½ yd. Bay City Model K. Condition good.
⅝ yd. Bay City Model K. Backhoe Crane Boom. 30' Boom. Rebuilt.
½ yd. Bay City Model 25 Shovel—late model—Condition real good.
½ yd. Byers Bearcat—26' Boom.
⅝ yd. Byers Bearcat crawler crane. 30' Boom—⅝ yd. bucket.
½ yd. Byers Bearcat—half revolving. 30' Boom. ½ yd. clamshell. Condition fair.
½ yd. Byers Crane. Model BB. 30' box type boom. Full swing.
½ yd. Hanson Shovel.
½ yd. Linkbelt Speeder Dragline Model B2. ½ yd. dragline bucket. 35' Boom.
½ yd. Linkbelt Speeder L196 Model B3 Shovel with shovel and dragline boom.
½ yd. Linkbelt Speeder Crane Model BB. 35' Boom, 15' jib. Condition good.
⅝ yd. Northwest Model 2 Shovel. Condition good.
½ yd. P&H—16'6" Shovel Front—12'6" Dipper Stick. ½ yd. bucket. Waukesha Motor. Condition good.
½ yd. P&H 150 Backhoe and Dragline Combination.
½ yd. P&H Model 150 Shovel and Dragline Combination. Condition real good.
½ yd. P&H Model 200 Shovel. Condition fair.
½ yd. P&H 206 Shovel. ½ yd. dipper bucket. Condition fair.
⅞ yd. American Hoist & Derrick Co. Shovel. 21' Shovel Front—16' Dipper Stick.
¾ yd. Browning Dragline and Shovel Model K2. 50' dragline boom. ¾ yd. bucket.
¾ yd. Bucyrus-Erie Model 10/30 Crane.
¾ yd. General Shovel. 16' Dipper Stick. 22' Boom. 1¼ yd. bucket. Condition good.
¾ yd. Keystone Shovel.
¾ yd. 1938 Koehring—Model 251 Shovel and Crane Combination. Condition real good.
¾ yd. 1939 or 1940 Koehring Model 251. 50' Crane Boom. Clamshell bucket.
¾ yd. Koehring Model 301 Shovel and Dragline. 25' Shovel Front—14' Dipper Stick. 45' Boom. ¾ yd. Hendrix Bucket.
¾ yd. Koehring Model 301 Shovel and Crane. 40' Crane Boom.
¾ yd. Diesel Linkbelt Speeder Model B5—built 1938-1939. Dragline and Shovel. Caterpillar D-8000 Diesel Engine. Rebuilt.
¾ yd. Linkbelt Speeder Shovel and Dragline Combination. Model B5.
45' box type dragline boom and ¾ yd. dragline bucket. Condition real good.
¾ yd. Lorain 40. 50' dragline boom. Rebuilt.
⅞ yd. Lorain Model 45. Condition good.
¾ yd. Marion 21 Diesel-Electric Shovel.
¾ yd. Northwest Model 3 Dragline. 40' Boom. Hendrix Bucket. Condition fair.
¾ yd. Northwest 105. 14' Dipper Stick. 9' Shovel Front. 22' Boom. Condition good.
¾ yd. Northwest Model 105 Shovel, 24' box type boom. 16' dipper stick. Condition good.
¾ yd. Osgood Shovel. 21½' Shovel Front. 16' Dipper Stick. 35' Boom. ¾ yd. Owen Bucket. Condition real good.
¾ yd. Osgood "Commander" 11 Shovel. 19'6" Boom. 16' Dipper Stick. 1 yd. bucket. Condition excellent.
¾ yd. Osgood Shovel Model "Conqueror." 1 yd. Shovel Front—50' Crane Boom—¾ yd. clamshell and dragline buckets. Cummins Diesel Engine.
¾ yd. P&H Model 400 Dragline. 35' Boom. Condition good.
¾ yd. 1940 Unit Model 10/20—Shovel and Dragline combination with ¾ yd. Omaha dragline bucket. Condition exceptionally good.
1 yd. Brownhoist Crane. 30' Boom. 36" Magnet and DeSoto 10 K.W. Generator Set. Condition very good.
1 yd. Koehring Model 201 Crane. 45' Boom.
1 yd. Koehring 301 Shovel. 40' Crane Boom. Condition excellent.
1 yd. Koehring 401 Shovel. 19'6" Boom. 16' Stick. Rebuilt.
1 yd. Lorain Shovel. Standard Shovel Front and Dipper Stick. Model 55. Condition fair.
1 yd. Lorain Model 60. 20' Shovel Front. 12'14" Dipper Stick.
1 yd. dipper bucket. 40' boom. Rebuilt.
1 yd. Northwest 105 Backhoe Dragline. 1 yd. Page dragline bucket. Condition good.
1 yd. Northwest 105. 55' Crane Boom.
1 yd. Northwest 105 Crane.
1¼ yd. Lima Dragline Model 101. 55' Boom. 1¼ yd. Williams Bucket. Condition good.
1¼ yd. Linkbelt K-35 Backhoe and Crane.
1¼ yd. Osgood Shovel Model 600 with Caterpillar D8800 Diesel Engine.
1¼ yd. 1940 Osgood High Lift Shovel Model 605. Cummins Diesel Engine. It is a real buy!
1¼ yd. P&H 600 Shovel. Condition good.
1¼ yd. P&H 600 Dragline. 55' Boom. 1½ yd. and 1¼ yd. Page bucket. Condition fair. Motor recently rebuilt.
1¼ yd. P&H 600A Shovel, Crane and Dragline.
1¼ yd. P&H Model 750. 60' Boom. 1¼ yd. bucket. Atlas Diesel Engine.
1¼ yd. Model 650 P&H Dragline and Shovel. 50' dragline boom. Shovel Front, fair leads and a practically new Page type RC 1¼ yd. dragline bucket.
1½ yd. Lima 602 Diesel Shovel and Dragline.
1½ yd. Koehring Dragline. 1½ yd. Page bucket and 2 yd. Omaha bucket. About 5 yrs. old. Condition good.
1½ yd. Lorain Model 77 Shovel and Dragline. Caterpillar D-11000 Diesel Engine.
1½ yd. Lorain Model 77 Shovel with trencher attachment. 7 yrs. old 21' Shovel Front. 16' Dipper Stick. 1½ yd. Amsco Bucket. Caterpillar Diesel Engine.
1½ yd. Marion 351. 21' Shovel Boom. 16' Dipper Stick. 60' Crane Boom. Rebuilt and guaranteed.
1½ yd. Northwest Model 6. 50' boom and bucket. Rebuilt and guaranteed.
1½ yd. Northwest 104 Dragline. 43' Boom. Condition fairly good.
1½ yd. Northwest 6. 60' dragline boom. 1½ yd. Page dragline bucket. Condition good.
1½ yd. P&H 700B Crane. 60' boom with fair leads.
1½ yd. P&H 750. 50' boom and 10' extension. Atlas Imperial Diesel Engine.
1¾ yd. Bucyrus-Erie E2 Dragline. Atlas Imperial Diesel Engine. 60' Boom.
1¾ yd. Koehring Model 701 Shovel. Caterpillar D13000 Diesel Engine.
1¾ yd. Koehring 700 Diesel Dragline. Waukesha Hesselman Diesel Engine.
1¾ yd. Page Class 11 walking type dragline. Page horizontal diesel engine. 65' Boom. 1¾ yd. Page bucket.
2 yd. Bucyrus-Erie E-2 Dragline. 50' Boom and 2 yd. drag bucket. Atlas Diesel Engine.
2 yd. Koehring 801 Shovel and Dragline. Buda Diesel Engine. 25' boom. 14' dipper stick. 75' dragline boom. Rebuilt and guaranteed.
2 yd. Lorain 87 Shovel. 30'1" Shovel Front. 27' dipper stick. Waukesha Hesselman Diesel Engine.
2 yd. Northwest 7 Crane Dragline. 3 yd. bucket.
2 yd. P&H Diesel Dragline Model 775. 60' Boom. Atlas Diesel Engine. Entirely overhauled. Kohler Lighting Plant.
2½ yd. Bucyrus-Monighan 2T Dragline. 82' Boom. Charter Oil Engine. Condition good. 2 yd. heavy-duty bucket.
2½ yd. 1941 Koehring Model 801—remodeled to 803. Shovel and Dragline combination. Caterpillar D17000 Diesel Engine. Rebuilt and guaranteed.
2½ yd. Diesel Lorain 95 Dragline. Caterpillar D17000 Diesel Engine. 2½ yd. dragline bucket.
2½ yd. Northwest Model 95 Diesel Dragline. 80' dragline boom. Murphy Diesel Engine. Condition exceptionally good.
2½ yd. Northwest 80D Diesel Dragline. 60' Boom. Lighting Plant. Condition good.
2½ yd. Northwest 8 Dragline. 90' Boom.
2½ yd. Northwest 80 Shovel and Dragline. 60' Boom. 2½ yd. dragline bucket, fair leads.
2½ yd. Diesel Northwest 80D shovel and dragline. Brand new Murphy Diesel Engine. 90' dragline boom and standard shovel attachment. Rebuilt and guaranteed.
3 yd. Bucyrus-Erie 52B dragline. Atlas Imperial Diesel Engine. 75' boom. Condition good. A Real Buy!
3½ yd. P&H Model 900 Crane. Fairbanks-Morse Diesel Engine. 100' boom. 40-ton swivel hook blocks. Kohler Light Plant 1500 Watt. Fair leads.
4 yd. 1944 P&H Model 955 Diesel Dragline. 80' Boom. Dragline bucket. Released from factory late 1944 and worked only six months.
5 yd. P&H Model 900 Diesel Dragline. Brand new Cummins Diesel Engine. 80' dragline boom. 5 yd. light weight dragline bucket. Condition good.

ELECTRIC SHOVELS AND CRANES

¾ yd. 20B Bucyrus-Erie all electric dragline
1 yd. Northwest Electric Shovel
1 yd. Northwest 105 Electric Shovel
1¼ yd. Marion 37 Electric High-Lift Shovel
1¾ yd. Bucyrus-Erie 42B Electric Tunnel Shovel
2 yd. Bucyrus-Erie Model 50B Electric Shovel
2½ yd. Marion 490 Electric Shovel
3 yd. Bucyrus-Model 14 Electric Dragline
3 yd. Model 125 Marion Electric Shovel
3 yd. Monighan Electric Dragline Model 3T
4 yd. Bucyrus-Erie 120B Electric Shovel
4 yd. Marion Model 125 Electric Shovel
6—7½ yd. Marion Model 7200 Electric Dragline

STEAM SHOVELS AND CRANES

8 yd. Bucyrus-Erie Model 3820 Dragline
6 yd. Marion 300 Steam Shovel
6—8 yd. Bucyrus-Erie 225B Shovel
6—8 yd. Bucyrus-Erie 230 Dragline
5 yd. Marion Model 92 Steam Shovel
4½ yd. Bucyrus-Erie Class 24 Dragline
4 yd. Marion 92 Steam Shovel
3½ yd. Marion 76 Steam Shovel
3½ yd. Bucyrus 175B Steam Shovel
3 yd. Bucyrus-Erie 100B Steam Shovel
2½ yd. Bucyrus-Erie Model 70
2 yd. Bucyrus-Erie 80B Steam Shovel
1¾ yd. Marion Model 37 Steam Shovel

FOR ANY OTHER CONSTRUCTION EQUIPMENT THAT YOU MIGHT BE INTERESTED IN, PLEASE PHONE OR WIRE US, PRESENTING YOUR REQUIREMENTS AND A PROMPT PROPOSAL WILL BE FORTHCOMING.

ECONOMY COMPANY, INC.

49 Vanderbilt Ave., New York, N. Y. **Tels. MUrray Hill 4-2294-8292-2295-2296**

BARGAINS FOR IMMEDIATE DELIVERY!

Frank J. Wolfe

MOTOR GENERATOR SETS AND ROTARY CONVERTERS

2—300 KW General Electric Motor Generator Sets, 250/275 volt DC, 3 phase, 60 cycle, 2300/4000 volt AC.
2—500 KW Allis-Chalmers Rotary Converters, 250/275 volt DC, 1200 RPM, 2300 volt transformers.

LOCOMOTIVES

2—15-ton Goodman, type 136-A, 250 volt DC.
4—13-ton Jeffrey, type MH-110, 250 volt DC.
8—8-ton General Electric, type HM-822, 250 volt DC.
9—6-ton General Electric, type HM-801 and HM-823, 250 volt DC.

All Completely Rebuilt and Guaranteed

LOADING MACHINES

2—#3 Automat Myers-Whaley Loading Machines.
Several 5 and 7-BU Joy Loading Machines.

CUTTING MACHINES

4—29-C Jeffrey Arcwalls, 250 volt DC.
5—29-B Jeffrey Arcwalls, 250 volt DC.

Several 3, 4 and 5-track Steel Tippples.

Electric Hoists from 200 to 1500 H.P.

We specialize in buying complete mines that are going out of business or from receivers in bankruptcy, administrators of estates, etc.

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WE HAVE JUST PURCHASED

All Machinery & Equipment of

THE INDUSTRIAL COAL MINE

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(Located about 20 Miles No. of Denver)

Consisting of 7-BU Joy Leaders, Joy Ramp, Joy Cutting Machine Crawler, 29-LE Coal Cutter, mounted on Joy Cats., Trolley Locomotives, 100 KW, 250 Volt Hertner Generator, direct connected to 440 volt 150 H.P. Syn. Motor, Hoists, Mine Cages, AC & DC Coal Cutters, 250 Pit Cars, Mine Lamps, AC & DC Motors, Conveyors, Box Car Loaders, Railroad Scales, Pumps, 15 Tons 16# Rail, 60 Tons 20# Rail, 35 Tons 40# Rail, 10 Tons 85# Rail, & hundreds of other items of equipment for a complete Coal Mine.

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ROTARY CONVERTERS

500 KW AL-CH SYN 275 V, 6 Ph., 60 Cy., 1200 RPM, Pedestal Type, 2300/4000 V. Transformers.
300 KW G.E. SYN. 575 V., HCC, 6 Ph., 60 Cy., 1200 RPM, form P, 2300/4000 V. Transformers.
150 KW WEST. SYN. 275 V., 6 Ph., 60 Cy., 1200 RPM, Bracket Type, 2300/4000 V. Transformers.

MOTOR GENERATORS

300 KW G.E., SYN. 600 V., 2300/4000 V., 3 Ph., 60 Cy., 1200 RPM, Semi-Automatic Switchgear.
300 KW WEST. SYN., 275 V., 2200/4000/6600 V., 3 Ph., 60 Cy., 900 RPM, Manual Switchgear.
150 KW WEST. SYN., 600 V., 2300/4000 V., 3 Ph., 60 Cy., 1200 RPM, Manual Switchgear.

LOCOMOTIVES

13-T WESTGHSE., 250 V., 908-C Mts., 36"-44" Ga.
13-T WESTGHSE., 500 V., 908-C Mts., 36"-44" Ga.
13-T JEFFREY, 500 V., MH-110 Mts., 36"-44" Ga.
13-T JEFFREY 250 V., MH-110 Mts., 36"-44" Ga.
13-T GOODMAN, 500 V., 36-B Mts., 36"-42" Ga.
10-T WESTGHSE., 500 V., 907-C Mts., 36"-44" Ga.
10-T WESTGHSE., 250 V., 907-C Mts., 36"-44" Ga.
8-T WESTGHSE., 500 V., 906-C Mts., 36"-48" Ga.
8-T WESTGHSE., 250 V., 906-C Mts., 36"-44" Ga.
8-T GEN. ELEC., 250 V., 839 Mts., 36"-48" Ga.

Each unit listed above is owned by us and is available now for immediate purchase.

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CARS FOR MOVING REFUSE SLATE AND GOB

78—50-Ton Side Discharge Hopper Cars, 1831 cu. ft., 50-ton capacity, Cast Steel Side Frames.
10—50-ton, 30 cu. yd., Magor Automatic Air Dump Cars. Lift doors with aprons.
25—40-ton, 20 cu. yd., Western Automatic Air Dump Cars. Lift Doors.
25—50-ton, 20 cu. yd., Western Automatic Air Dump Cars. Lift Doors.

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IRON & STEEL PRODUCTS, INC.

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"*ANYTHING* containing IRON or STEEL"

COAL MINE HOIST

300 HP Ottumwa Iron Works Double Cylindro-Conical Drum Electric Hoist, cast steel Herringbone machine-cut gear and pinion, shaft directly connected to: 300 HP General Electric slip-ring motor, variable speed, form M, 3 ph., 60 cy., 2200 volts, 600/580 RPM. With full contactor control and resistance including incoming line panel with oil switch, ammeter, disconnecting switches. Fully Reconditioned.

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Liberal Price Reductions

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Attractive allowances have been made in our pricing program to move this steel into the hands of private industry.

HOT ROLLED PLATES

Carbon and Alloy. Wide range of sizes from ¼" to 6" thick, up to 96" wide.

TOOL STEEL

7,000 tons. In Water-hardening, Oil-hardening and High Speed grades. Large range of bar sizes.

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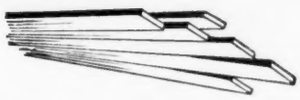

Available in Hot Rolled and Cold Rolled, Carbon and Alloy. Large quantity of High Carbon Cold Rolled Strip—to be sold at low Carbon prices—or lower. Large range of sizes.

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Hot Rolled and Cold Finished in both Carbon and Alloy. Rounds, squares, flats and hexagons in various specifications. Many items in large quantities.

Write, wire or phone your requests to the nearest RFC agency listed below for more detailed information. If you desire, credit terms can be arranged. If your local office does not have all the materials you need, it will endeavor to locate them from other offices throughout the country.

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1. Carbon and Alloy Billets, Blooms, Slabs, Skelp, Rods, etc. . . . ☐
2. Reinforcing Bars . . . . . ☐
3. Structural Steel Shapes . . . ☐
4. H. R. & C. R. Sheets, Strip Steel, Carbon and Alloy . . . . . ☐
5. Plates—Tin Plate, Terne Plate, Black Plate . . . . . ☐
6. Wire and Wire Products, Carbon and Alloy, Wire Rope, Reinforcing Wire Mesh . . . . . ☐
7. Stainless Steel Sheets, Strips, Standard Types . . . . . ☐
8. Iron and Steel Pipe, and Tubing—Valves and Fittings . . . . ☐
9. Mechanical Tubing, Carbon and Alloy . . . . . ☐

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157-1

REBUILT EQUIPMENT—READY TO SHIP

MOTOR GENERATOR SETS

1—100 kw. 500 v. DC Gen. 1750 rpm. dir. con. 150 HP 440 v. 3 ph. 60 cy. type CS Motor.
1—100 kw. 720 rpm. 250 v. W. Gen. dir. con. 2200 v. 3 ph. 60 cy. Syn. Motor.
1—100 kw. 1200 rpm. 250 v. W. type SK Gen. dir. con. 2300-440 v. 3 ph. 60 cy. Syn. Motor.
3—100 kw. 250 v. W. Gens. dir. con. 220/440 v. 3 ph. 60 cy. Motors.
4—75 kw. 250 v. W. Gens. dir. con. 440 v. 3 ph. 60 cy. AC Motors.
1—75 kw. 230 v. 850 rpm. G.E. Gen. dir. conn. to 220/440 v. 3 ph. 60 cy. Motor.
2—65 kw. 1800 rpm. 250 v. G.E. Gens. dir. con. 60 cy. AC Motors.
4—50 kw. 250 v. DC Gens. dir. con. 220/440 v. 3 ph. 60 cy. AC Motors.
2—40 kw. W. 250 v. DC Gens. dir. con. 220/440 v. 3 ph. 60 cy. AC Motors.
2—30 kw. 250 v. DC cp. wd. Gens. dir. con. 220/440 v. 3 ph. 60 cy. AC Motors.
2—25 kw. 250 v. DC W. Gens. dir. con. 220/440 v. 3 ph. 60 cy. Motors.

MINE LOCOMOTIVES

1—5 ton Ironton Storage Battery Locomotive.
1—13 ton Westinghouse 42" ga. 250 v. Locomotive, two motor type: single end control.

PUMPS

1—Amer. Piston Pump—5½x4½"—size 8x12.
1—48 GPM 161' hd. Roper 3" suc. 3" dis.
1—90 GPM 225 ft. head, 600 rpm. 2x2" Blackmer
1—220 GPM 225 ft. head, 600 rpm. 3½"x3" Blackmer
1—230 GPM Amer. Steam Pump Co. 115' hd. 5½" intake x 4½" discharge, 45 rpm.
2—500 GPM Morris Machine Wks. 4" suc. 4" dis. 123' hd. 1760 rpm.
1—500 GPM Ingersoll Rand "Cameron" 4" suc. 3" dis. 1750 rpm.
1—3000 GPM De Laval 144' hd. 150 HP.

SLIPRING MOTORS—3 ph. 60 cy.

HP	Make	Type	Volts	RPM
700	G.E.	MT-432	2200	393
260	Burke	EMV-65	440	600
75	G.E.	I	220/440	1200
60	West.	CW	220	1800
50	West.	HF	220/440	1120
50	Chand.		220/440	1800
20	Al. Chal.		440	1130
15	West.	CW	220	870

230 V. DC MOTORS

HP	Make	RPM	Type
5	Cr. Wh.	960	CM
5	Cr. Wh.	980	CM
5	Imperial	540	SK
5	Westg	850	
10	Cr. Wh.	825	CM
10	Cr. Wh.	675	CCM
40	West.	850	S-7
75	G.E.	600	MP
80	West.	490	76A
85	West.	500	M
100	West.	300	SK
100	West.	300/700	SK
100	West.	625	S-13L
120	West.	800	SK-170
120	Burke	750	

TRANSFORMERS

No.	Kva.	Pri.	Sec.	Make
9	5	2200	110/220	G.E.&West.
85	7½	2200	110/220	G.E.&West.
16	10	2200	110/220	G.E.&West.
21	15	2200/1100	440/220/110	West.
3	15	2200	110/220	Packard
3	15	2200	110/220	Cr. Wh.
2	20	1150/2300	115/230	Maloney
1	20	2300	110/230	West.
2	20	2200/1100	440/220/110	West.
2	25	2300	110/220	West.
6	37½	2400	240/480	G.E.
3	40	2200/1100	220/110	West.
1	40	1100/220	110/220	Pittsburgh
1	40	2300/1150	115/230	Maloney
2	50	2200	110/220	Packard
1	50	6600	550/440	Allis Chal.
1	50	2200/1100	220/110	West.
2	50	2200/1100	220/110	Maloney
1	75	2400	240/480	G.E.
1	75	2400/4160Y	120/240	West.
3	100	2400	480	Allis Chal.
3	125	2200	220/440	G.E.
2	150	2200/2300/2400	220/230/240	G.E.
3	250	6600/5940	2300	West.

DIESEL ENGINE GENERATOR SET

1—50 kw. 250 v. DC Gen. dir. conn. to 65 HP Primm Diesel Hor. Engine.

COMPRESSORS

2—315 CFM Ingersoll Rand portable 100# pres. driven by 105 HP Waukesha Oil Engines, 860 rpm.

DUQUESNE ELECTRIC & MFG. CO., PITTSBURGH (6), PA.

LOCOMOTIVES

All 250 Volt

1—4-Ton Westinghouse, type 902 with reel, 42 or 44" gage
1—5-Ton Goodman, type 2600-R, 42 to 48" gage, with reel
6—Ton Goodman, type 30-C, 42 to 48" gage, with reel
1—8-Ton Goodman, type 32-0-4-T, 42" gage

CUTTING MACHINES

1—29-C Jeffrey arcwall, 250 volt, any gage
1—29-B Jeffrey arcwall, 250 volt, any gage
2—12-AA Goodman shortwalls, 250 volt, with or without trucks
1—12-AB Goodman shortwall, with or without truck, 250 volt
1—112-AA Goodman universal, with or without truck, 250 volt
1—CR-2 Sullivan shortwall, low vein with truck, 250 volt
1—CR-8 Sullivan shortwall, 250 volt, no truck
1—CE-7 Sullivan shortwall, 250 volt, with truck
2—35-L Jeffrey shortwalls, 220-440 volt A.C.

SUBSTATIONS

1—75-KW. G.E. Motor-Generator set complete with switchboard 275 volts D.C. 2300 or 4000 volts A.C.
1—80-KW. Westinghouse Motor-Generator set complete, 250 volt D.C. 2300 volt A.C.
1—100-KW. G.E. Rotary converter, 275 volt

MISCELLANEOUS

10—300 and 400 ampere welding machines, G.E., Hobart, Lincoln
2—Vertical Milling machines with direct motor drives
1—150 HP. Ottumwa hoist with 1¼" rope, 220/440 volt motor and reversible drum controller, hydraulic brakes, suitable for slope or shaft
1—125' LaDel Underground belt conveyor, 18" wide, practically new, can be extended to 800 or 1000 feet, equipped with D.C. motor and magnetic starter.

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NEW DC MOTORS

G.E. Type CD—230 V.—1800 R.P.M.

Qty.	H.P.	Price Each
2	1	$ 82.00
3	7½	246.00
3	20	398.00
2	25	448.00
1	50	702.00

the NEW ELECTRIC MOTOR CO.
P. O. Box 1088 • Glen. 2121 • Rochester, N. Y.

LATHES

36" x 18' Putnam Grd. Hd. Q.C. Lathe.
36" x 24' Putnam Grd. Hd. Q.C. Lathe.

RADIAL DRILLS

6' American Triple Purpose, M.D.
6' Cincinnati Bickford Radial M.D.
7' Cincinnati Bickford Radial M.D.
5' American Triple Purpose Plain.

CINCINNATI MACHINERY & SUPPLY COMPANY
218 E. Second St., Cincinnati, Ohio

Equipment For Sale

1—Traylor Gyratory Crusher, First Class Cond., #410 T.Z. Serial No. 27784.
1—Willey D. C. 50 K. W. Generator direct connected to Ridgeway Steam Engine. 125 V. 400 Amp.
1—Starting Compensator, No. 856644, Type #NR2040, Form A3, Volts 2300 for Synchronous Motor, ATI KVA150, Cycles 60, Phase 3, G. E.

Following D. C. Electric Motors:

1—Jantz & Liest Motor, 20 H.P., 110 V. 1050 RPM, Serial #1320.
1—Emerson Motor, 1 H.P. 115 V. 1750 RPM, Serial #P78608.
1—Emerson Regulating Starter, Cutler Hammer.
1—Emerson Motor, 1 H.P. 115 V. 1750 RPM, Serial #78607.
1—Emerson Regulating Starter, G.E.
1—Allis Chalmers Motor, 20 H.P. 110 V. 1000 RPM, Serial #7DK28.
1—Allis Chalmers Starter & Switch.
1—Jantz & Liest Motor, 7½ H.P., 110 V. 900 RPM Serial #1211.
2—125 ft. lengths—Topsall 2" Hawser laid Drilling Cable.

THE KENTUCKY STONE COMPANY, INC.
214 Fincastle Bldg. Louisville 2, Ky.

MINE HOISTS

1—Wellman, Keyed Drum, 60" Dia. will coil 4500 ft. 1" rope. 200 or 300 H. P. Motor with Magnetic Control.
1—Vulcan, Shaft Hoist, 72" Dia. Suitable 300 ft. Shaft. Motor with control to suit rejuirements.
1—Nordberg, Shaft Hoist. 72" Dia. Suitable 200 ft. Shaft. 150 H.P. Motor with Control.
1—Vulcan, Cylindro-Conical, Shaft Hoist. Drum 7'-9' Dia. Suitable 350 ft. Shaft. 400 H.P. Motor with Control.

Other Hoists Available to suit all mining conditions.

JONES MINING EQUIPMENT CO.
Empire Building, Pittsburgh 22, Pa.

---

26 & 60 INCH CONVEYOR BELTS

6600 Ft. 26 in. 5 Ply.
2175 Ft. 60 in. 10 Ply.

R. C. STANHOPE, INC.
60 East 42nd St. New York 17, N. Y.

NEW and REBUILT
STORAGE BATTERY

LOCOMOTIVES

1½ to 10 Ton 13" to 56" Track Gauge

GREENSBURG MACHINE CO.
Greensburg, Penna.

NEW and REBUILT

Automatic Breakers—Rotary Converters
Motors - Control - Transformers
Fuse Cutouts - Meters - Relays

R. H. BENNEY EQUIPMENT COMPANY
Norwood 12, Ohio
Better Known—Known To Be Better

COAL CUTTING MACHINES

2—35B Jeffrey 250 V., shortwalls.
2—35BB Jeffrey A. C. shortwalls.
2—35B Jeffrey 500 V., shortwalls.
1—124EJ Goodman, 50 HP, 250 V., permissible track mounted slabbing machine.
1—12DA Goodman, 50 HP, 250 V., D. C.
1—29C Jeffrey top cutting arcwall 250 V., D. C.
1—12G3 Goodman, shortwall, 3/60/220 V., A. C.
1—12AB Goodman shortwall, 250 V., D. C.
1—36B Jeffrey 250 V., 14" high.

ELECTRIC LOCOMOTIVES

1—13 Ton GE with HM-809 motors.
1—10 Ton Jeffrey with MH-110 250 V., motors.
1—10 Ton GE steel frame, 250 V., with HM-830A motors.
2—6 Ton Jeffrey, MH-88 motors, any gauge.
1—6 Ton GE, with HM-823 motors.
2—5 Ton Goodman 250 V., 36" gauge.
1—4 Ton Jeffrey, with MH-96 motors.

MISCELLANEOUS

1—165 HP GE Syn. 2200 V., 900 RPM motor.
1—100 KW GE type TCC, form P, Rotary Converter, 275 V., D. C. with 2300-4000 volt transformers.
1—100 Ton Wheel Press.

TIPPINS MACHINERY CO.
Pittsburgh 13 Pennsylvania

RAILS NEW AND RELAYING
TRACK ACCESSORIES
from **5** Warehouses
• PROMPT SHIPMENTS
• FABRICATING FACILITIES
• TRACKAGE SPECIALISTS
EVERYTHING FROM ONE SOURCE
L. B. FOSTER COMPANY
PITTSBURGH · CHICAGO · NEW YORK

RELAYING RAIL
TRACK ACCESSORIES
MIDWEST STEEL CORP.
Gen. Off.: CHARLESTON, 21, W. VA.
Warehouses
CHARLESTON, W. VA.
KNOXVILLE, TENN. • PORTSMOUTH, VA.

RAILS — CARS
All sections of rails and good serviceable second hand cars, all gauges, also spikes, bolts, frogs, switches and ties.
M. K. FRANK
480 Lexington Ave. New York, N. Y. Reno, Nevada
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MINE FANS
Robinson 7' HSPC, Centrifugal with 50 HP, KT-346 Motor, compensator and V-belt drive.
Jeffrey Aerodyne 42", Type 8H-42 adjusted pitch, V-belt drive. Jeffrey 6' Centrifugal.
GUYAN MACHINERY COMPANY
Logan, West Virginia

REBUILT MINING EQUIPMENT

DOUBLE DRUM HOIST
1—50 HP Lidgerwood Double Drum Hoist, drums 24" x 24", good for 5000# RP and 4000 ft. of ½" rope, motor driven
MOTORS - GENERATORS - TRANSFORMERS
JOHN D. CRAWBUCK CO PGH. (12) PA.

FOR
IMMEDIATE DELIVERY OF RUBBER PRODUCTS
Conveyor Belting...Transmission Belting...Elevator Belting...Fire, Water, Air, Steam, Suction or Welding Hose, etc.

CALL, WIRE or WRITE
CARLYLE
THE RUBBER HEADQUARTERS

CARLYLE RUBBER PRODUCTS ARE NEW, GUARANTEED & LOW PRICED

CONVEYOR BELTING

ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"
42"	5	1/8"	1/16"
36"	6	1/8"	1/16"
30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

Inquire For Prices - Mention Size and Lengths

ENDLESS "V" BELTS

"A" WIDTH All Sizes | "D" WIDTH All Sizes
"B" WIDTH All Sizes | "E" WIDTH All Sizes
"C" WIDTH All Sizes | Sold in Matched Sets
Inquire For Prices - Mention Size and Lengths

PROTECT THAT PLANT
FIRE HOSE

APPROVED SPECIFICATION HOSE
EACH LENGTH WITH COUPLINGS ATTACHED

Size	Length	Per Length
2½"	50 feet	$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

SPECIAL OFFER . . . HEAVY DUTY
RUBBER HOSE

WATER HOSE
Each Length with Couplings Attached

I.D. Size	Length	per Length
¾"	25 feet	$4.25
1"	50 "	8.00
	25 "	6.25
1¼"	50 "	12.00
	25 "	7.50
	35 "	10.50
	40 "	12.00
1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

AIR HOSE

I.D. Size	Length	per Length	Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
	50 "	20.00	3.50 "

LARGER SIZES ALSO AVAILABLE
All Prices—Net—F.O.B. New York

CARLYLE RUBBER CO., INC.
62-66 PARK PLACE NEW YORK, N. Y.

AIR COMPRESSORS:
12—Belted 360, 676, 870, 1000, 1300 ft.
12—Diesel 105, 315, 520, 676 & 1000 ft.
6—Electric 1300, 1500, 2200, 5000 ft.
RUBBER CONVEYOR BELTS:
1000', 60". 600', 30". 300', 20". 1000' 42". 900', 48". 1450', 36". 1200', 24". 900', 18". 600', 16". 350', 14".
ELECTRIC LOCOMOTIVES:
15—3, 5, 8 ton Battery & Trolley.
DIESEL GENERATORS:
12—100, 150, 180 & 480 KW.
MINE LOADERS:
17—GD9, Elmco 21, Conway 20, 50, 60 & 75 and Sullivan HL3.
STEEL TANKS:
30—8000, 10,000 & 20,000 gallon capacity.
SHOVELS—DRAGLINES:
7—1 yd., 1½ and 2 yd. Gas & Diesels.

R. C. STANHOPE, INC.
60 E. 42nd Street New York 17, N. Y.

Copper Wire & Cable

300,000 C.M. 19 Strand Bare Cable (25,000 ft. new on reels)
250,000 C.M. 19 Strand Bare Cable (4,000 ft. new on reels)
250,000 C.M. 19 Strand Triple Braided W.P. Insulation (12,500 ft. new on reels)
1/0 W.P. Insulation 7 Strand (50,000 ft. on reels, good reusable condition)
2/0 W.P Insulation 7 Strand (8,000 ft. on reels, good reusable condition)
Large quantities new 1/0 Solid Bare, #2 Solid Bare and many other sizes. All from stock.
Also all sizes guaranteed relaying rails, Mining Equipment, Diesel Engine Generator Sets.

GLAZER IRON & METAL CO.
Phone 3-0739 Knoxville, Tenn.

SEARCHLIGHT SECTION

LOCOMOTIVES

Goodman: All 250 volts.
1—6 ton, 30B, 43" 1—5 ton.
1—5 ton, W-1-2, 36".
2—5 ton, 2600 K.
1—6 ton, 33-1-4-T.
2—8 ton, 32-1-4-T.

Westinghouse: All 250 volt.
1—4 ton, 902, 48".
1—904 c. 44" 500 volt. Also 906 motors.
1—10 ton, 915, and 907.
Bar steel frames 10 ton, 6 ton, and 4 ton.

G.E.: All 250 volt. 4 ton 1022, 44" as is
6 ton 803, 44" as is 5 ton 825, 44" & 36"
6 ton 823, 44" 8 ton 839 motors
6 ton 801
8 ton 839
Battery Locomotives G.E., Ironton, Atlas. Whitcomb and 1½ ton Mercury.

Jeffrey: 6 ton, and 4 ton, all gauges, 250 volt. 8 ton and 10 ton.

MINING MACHINES

Jeffrey: 35B and 4—28A, 250 V. 4—29B, 29C, 29CE with shearing head. Also 1 on cats. Revolving head for 29C.
35BB **Jeffrey** mining machine.
1—35 BB AC 220 volt.
Goodman, 12A, 12AB, 12AA, 12G3A, 24B.
1—12G3 220 volt and 2—112 DA, 500 volt.
2—Permissible Type 12CA. 6—112AA.
2—124 E.J.
Motors for 212AA, both 250 and 500 v.
Sullivan, CE7, CE9, CE10, CR10 Low Vein. CR5 for middle cutting.

SUBSTATIONS—275 volts, D. C.

2—200 KW **G.E.** Rotaries (600 volt).
2—150 KW **West.** Rotary.
1—200 KW 1—100 KW **Ridgway** M-G Sets.
2—100 KW **G.E.** Rotary.
1—200 KW **Westinghouse** M-G Set 900 RPM, 2300-275 volt.
1—100 KW **Westinghouse** M-G Set.

SPARE ARMATURES

Jeffrey MH 110, MH 78, MH 73, 29B, 35B and 28A. **Goodman** 34B, 30B, 30C, 12A, 12AB, 12AA, 33-1-4-T, 31-1-4-T. **General Electric** 801, 803, 819, 821, 825, 839. **Westinghouse** 904, 906, 102, 907, YR2, 115. Also 200 KW **Westinghouse Rotary Converter Armature,** 250 V Bracket Type, 150KW G. E., HCC Bracket Type, and 150 KW G. E., TC Pedestal Type. **Sullivan** CE6, CE7, CE9 and CE10.

AERIAL TRAMWAYS • HOISTS • PUMPS • MOTORS • TRANSFORMERS • BOND WELDERS • RESISTANCE • COMPRESSORS • DUMPS • SPEED REDUCERS FIELD FRAMES • ARMATURES • GOODMAN HYDRAULIC SHOVELS • MOTOR STARTERS AND CONTROLLERS—AC & DC • DROP BAR SUPPORTS (Gooseneck). 29B and 29C • MINING MACHINE TRUCKS • SWITCHBOARDS • CIRCUIT BREAKERS—AC & DC • COAL CRUSHERS (double roll) 12"x16", (single roll) 24"x36", 24"x24" • LATHES, SWITCHES • AUTOMATIC CIRCUIT BREAKERS 250 volt 600 amps to 2000 amps • MANUAL CIRCUIT BREAKERS 600 amps to 3000 amps • HOISTS, overhead, AC 3-60-440, 1 ton and 2 ton • 1 clam shell bucket 1¾ cubic yard • MINE CARS • 2 SULLIVAN BIT SHARPENERS • R. R. SWITCHES 85# to 100# GENERATORS DC 250-275 volt, 30 KW to 100 KW. Also SPARE MOTORS DC and AC for mining machines and locomotives. BELT CONVEYORS, SLATE, LARRY. 2—14BU Joy Loaders, 250 v. on Cats. 2—5BU on Cats. 1—8BU on Cats. 2—Myers-Whaley, #3 and #4 Automatic and other loaders. DIESEL POWER PLANTS, 50 KW to 250 KW

GUYAN MACHINERY COMPANY, Logan, W. Va.

-TRANSFORMERS-

3—1667 KVA 44000-2300/4000Y
3— 667 KVA 6900/12000Y-2300
3— 500 KVA 13200-2300
3— 333 KVA 23000-575
1—2500 KVA 26400/13200-480/460/440, 3-ph.

One Year Guarantee

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI 27, OHIO

PIPE—MACHINERY—GAS ENGINES AIR COMPRESSORS—DIESELS—PUMPS

Some Steam Engines and Boilers available only slightly above the metal price

BRADFORD SUPPLY COMPANY
WAYNE, WOOD COUNTY, OHIO Near Toledo

PIPE New & Reconditioned

ALL SIZES for ALL PURPOSES
Cut and Threaded to Your Specifications
VALVES AND FITTINGS
UNITED PIPE & SUPPLY CO. Department 110 NORRISTOWN, PA.

NEW AND GUARANTEED Used Steel Pipe and Boiler Tubes

Steel tanks—steel buildings
all sizes and kinds
Valves and fittings

JOS. GREENSPON'S SON PIPE CORP.
Natl. Stock Yds., St. Clair Co., Ill.

IRON and STEEL PIPE

New and Used

Large stocks, all sizes
attractive prices

L. B. FOSTER COMPANY
P. O. Box 1647 Pittsburgh 30, Pa.

TOP CUTTING MACHINE

1—Goodman type 724 E J 250 volt. 9 ft. Cutter Bar with two chains, adjustable from 35" to 77" cut.

JONES MINING EQUIPMENT CO.
Empire Bldg. Pittsburgh 22, Pa.

For Immediate Shipment

215 all steel mine cars—80 new, remainder slightly used, end dump (may be easily changed to tight end for rotary dumping), 14" Timken bearing wheels, 42" gauge, 40" wheel base, 6'6" overall width, 11'6" overall length, 34" high above rail—loading end dropped to 28", capacity 124 cubic feet level full, equipped with semi-automatic spring couplers.
100 sets steel side boards to increase capacity of cars to four tons if desired.
One Phillips cross-over dump, 42" ga.—new.
One heavy duty trip feeder—specification upon request.
One "Nolan" automatic cager.
Three sheave wheels, 84" dia for 1⅜" rope.
Two Holmes self-dumping cages—used.
One Holmes self-dumping cage—new.
Two sets dumping brackets for cage—used.
683 lin. ft. 1⅜" dia. 6x19 blue center hoisting rope.

Templeton-Matthews Corp.
Sycamore Bldg. Terre Haute, Ind.
Crawford 7051

FOR SALE— SHASTA DAM SAND AND GRAVEL PLANT EQUIPMENT

Including—
GOODYEAR 9-MILE-HAUL 36" SPECIAL CONVEYOR BELTING
16,000' of Belt Remaining With Idlers, Pulleys, and Drives
ALSO—
Electric Motors, Line Equipment, Transformers, and Supplies
Pendulum Boom Belt Conveyors, 100' and 200'
Merrick Feedoweights and Weightometers
Dorr Hydroseparator, 20' x 4'
Marcy Rod Mill, 8' x 12'
Vibrating Screens
Dorr Rake and Bowl Classifiers
Extra-heavy Gravel Washer, Trommel type
Pumps: Centrifugal, Deep-well, Steam, Dredge
Auxiliary Equipment: Chain Hoists, Winches, Welding Machines, etc.

Subject to Prior Sale

Write, Wire, Telephone Redding 1440

Columbia Construction Company, Inc.
Box 579 Redding, California

FOR SALE

2—Drag-line "Scooter" conveyors
Complete with Sullivan J-214 2-drum hoists.

PLAINFIELD MINING CO.
Plainfield, Ohio

MINING MACHINES

AC & DC

REBUILT & GUARANTEED FOR IMMEDIATE SHIPMENT

COAL CRUSHERS
Single & Double Roll
Electric Coal Drills, Mine Fans, Tipple Scales, etc.
Ironton 5-ton Storage Battery
Locomotives 36" or 42" Gauge, with or without batteries
Equipment of all kinds
Buy, Sell or Exchange

THE INDUSTRIAL EQUIPMENT CORP.
705 First National Bank Bldg.
Pittsburgh 22, Pa.
Warehouse: Carnegie, Pa.

PROMPT SHIPMENT FROM OUR WAREHOUSE

MINING MACHINES

2—35 BB Jeffrey AC shortwall 220/440 v. 3 ph. 60 cy. 6' Bowdil Bar & Chain, any gauge.

2—12 DA 50 HP 250 v. Goodman Shortwall.

SYNCHRONOUS MOTORS

HP	Make	Speed	Voltage
150 (2)	West.	600	440/220
100	West.	1200	440/220

STORAGE BATTERY LOCOMOTIVES

2—6 Ton G.E. Permissible Locomotives 36/44" Ga. O.S. armorplate frame. Inside steel tired wheels. 2-HM 825 Ball Bearing Motors. Type LSBE. Class 2C6 Form C9. 13½' long, 50" high, 69" wide and 44" Wheel base.

Each of the above units equipped with Edison Battery 80 cell A-10—one new in 1940, the other in 1939.

1—5 to 5½ Ton Type D Ironton, 36 or 42" Ga.

1—5 Ton Atlas 40" or 44" Ga. with 2 Ball Bearing Motors. Battery box on top of locomotive.

4 Ton 36" Ga. Atlas 2 BB Motors.

4 Ton 36" Ga. G.E. 2 BB Motors.

Haulage & Gathering Locomotives

13 Ton Westgh. 250 v. 36" or 40" Ga.
13 Ton Westgh. Bar Steel 500 v. 40/42".
10 Ton Jeffrey 500 v. 36/42" Ga.
2—6 Ton G.E. 500 v. 42/44" Ga.
2—6 Ton G.E. 250 v. 42/44" Ga. HM 801 BB Motors
2—5 Ton 30B Goodman 250 v. 36" Ga. elec. reel.
1—5 Ton Morgan Gardner 250 v. 36/42" Ga. gath.

SCREENS

2—4" x 5' single deck Tyler Hummer Screens. Type 37 equipped with V-16 Vibrators No. 2860 and 2867 designed for 110 v. AC 15 cy.

Rotary Con. & MG Sets (3 ph. 60 cy.)

2—300 KW G.E. HC 12 Rotary 275 v. 6 ph. with—3—125 KVA G.E. 2300 v. 1 ph. 60 cy. Trans.
150 KW Ridgway 275 v. 900 RPM dir. con. 225 HP Ridgway Syn. Motor 2300 v. complete.
150 KW 250 v. Cr. Wh. 600 RPM dir. con. 200 KVA 440/220/3/60 West. Syn. Motor.
100 KW Ridgway, 250/275 v.—150 HP Ridg. Syn. 220/440 v. 1200 RPM with AC & DC Panels.
75 KW 250 v. Westgh. 1200 RPM Gen. dir. con. 100 HP West Syn. Motor 440/220/3/60 1200 RPM.
50 KW Cro. Whe. 250 v. 900 RPM dir. con.
75 HP 220/440 v. West. CS 900 RPM Motor.
35 KW 125 v. S West —54 HP West. 220/440 v.
15 KW West. SK 125 v. 1150 RPM Gen. dir. con. 25 HP Cr.Wh. 2200/440/3/60.

ENGINE GENERATOR & TURBINE SETS

65 HP Primm Oil Engine belted to AC or DC Gen.
57.5 KVA Allis Chalmers Gen. 220/3/60—Kerr Tur.
50 KW West. 125 v. DC—Skinner Engine.
50 KW 125 v. DC West. Turbo Gen.

TRANSFORMERS

Qu.	KVA	Prl. V.	Sec. V.
31	7½	2200	220/440
28	10	2200	220/440
2	25	2200	110/220
1	37½	2200	110/220
3	50	22000	2200

HOISTS

100 HP Lidgerwood sgl. fr. drum geared to 100 HP G.E. slip ring 220/440 v. 3 ph. 60 cy. MTC. Rev. drum & resistance.
50 HP Thomas sgl. fr. drum 26" x 25"—4" figs.
40 HP Lidgerwood sgl. fr. drum geared to 40 HP G.E. slip ring 220/440 v. 3 ph. 60 cy. MTC. Rev. drum & resistance.
30 HP Carlin double dr. fr. 13" x 18"—5½" figs.
10 HP Diamond sgl. fr. drum geared to 10 HP G.E. 220/440 v. 3 ph. 60 cy. Motor.
10 HP Hoist sgl. fr. dr. 22" Face 12" dia. 7" figs. dir. con. 10 HP AC Motor.
The above Hoists can be equipped with AC or DC Motors.

COAL CRUSHERS

18 x 24 and 18 x 30 New Scottdale dbl. roll.

SLIP RING & SQ. CG. MOTORS

HP	Make	Speed	WDG	Type
300	West.	1750	S.R.	CW
200	G.E.	250	S.R.	MT 412
150	G.E.	600	S.R.	I-M
100	West.	1750	S.R.	CW
100	G.E.	500	S.R.	M1-25 cy.
75	G.E.	720	S.C.	I-K
50	West.	870	S.C.	CS
40	West.	1200	S.C.	CS587C
40	G.E.	900	S.R.	MTC
25	West.	575	S.R.	CW
20	West.	1200	S.C.	CS
20	West.	900	S.C.	CS
15	West.	1750	S.C.	BB
3 (10)	West.	1150	S.C.	CS

Other sizes down to 1 HP

DC Motors and Generators 230/250 V.

HP	Make	Speed	WDG	Type
175	G.E.	475	ser.	MD 109
150KW	Cr. Wh.	550	cp.	
130	G.E.	550	ser.	CO 1812
100	G.E.	480	ser.	MD 108
60	Cr. Wh.	800	cp.	
50KW	Cr. Wh	1050	cp.	
50	Reliance	1500		185T
40	Roth	1500		SK 80L
25	West.	1750		SK
20	West.	1750		SK
20	West.	750		SK
20	West.	1750		
15	Cr. Wh.	800	sh.	CM
15	West.	560	cp.	S
7½	G.E.	825		CVC

PUMPS

4" suc. 4" dis. Lee Courtney Cent.—dir. con. 40 HP AC or DC Motor.
100 GPM 300' Head F. M. 2 stage, with 15 HP F.M. Motor 220/440 v. Motor.

AIR COMPRESSORS

9" x 8" Chg. Pneu. Type NSB 175 cu. ft. 100#.

MOORHEAD-REITMEYER CO., INC. Pittsburgh 19, Pennsylvania

Serving the Coal Industry for more than a Quarter of Century

5—Jeffrey 35A shortwall machines 250 volts D.C.
1—Jeffrey 36B Longwall machine 250 volts D.C.
3—Jeffrey 24B Longwall machines 250 volts D.C.
1—Flory hoist 100 H.P. 440 volts, 3 phase, 60 cycles.
5—Battery Locomotives 36" Gauge.
3—Jeffrey 35L Shortwall, low vein machines, 220/440 Volts A.C.

BERRETTINI ELECTRIC CO.

378 N. MAIN STREET, PLAINS, PA.

Electric Equipment

New & Rebuilt

...for Mines and Mills...

Highest Quality Obtainable

Convertors and Motor Generator Sets, A. C. and D. C. Motors, Controls and Transformers. Available items too numerous to mention.

Over 25 years of Electrical Engineering Background.

C. B. LOCKE CO., P. O. Box 3227 Tel. 38-136 Charleston, W. Va.

FOR SALE

HOISTS

1—Shepard Niles Electric Hoist to raise loading boom conveyors, capacity 2000#, 5 HP, 3 ph, 60 cy, 440 volts, with controls.

1—Ottumwa Electric hoist, single rigid-cylindro-conical drum, with automatic control. Weight of cage 7000#, weight of car 2500#, weight of coal 6000#, lift 310', diameter of rope 1¼". Diameter of drum 60"x84", Brake, 84" diameter, 8" face, post type, oil operated. Drum shaft bearings 10"x20". Hoist is equipped with single reduction gears 19 and 229 teeth, 2½ D.P. 11" face. The drum has five grooves on the 60" diameter, 11 grooves up the cone, 4 grooves on the 84" diameter. The drum has a rope capacity of 326 feet plus three dead turns. The hoist is equipped with a 200 HP motor.

MINING MACHINES

1—Goodman Universal Shortwall mining machine, 112DB. DC, 250 volts, Cincinnati Duplex chain, 6' cutter bar. Has new extra armature. 36" o. 42" gauge.

3—Goodman Longwall mining machines, DC, 36" or 42" gauge.

6—Jeffrey 35A Shortwall mining machines, 50 HP motors, 250 volts, DC. 6' cutter bars, 36" or 42" gauge.

3—Sullivan CE-7 Shearing machines, 250 volts, DC. 7 ft. cutter bars, 36" or 42" gauge.

1—Sullivan CE-7 Shearing machine, AC, 220 volts, 3 ph, 60 cy, 7 ft. cutter bars, 36" or 42" gauge.

1—Sullivan CE-7 Shortwall mining machine, AC, 220 volts, 3 ph, 60 cy, tip-turn truck, 7 ft. cutter bar, 36" or 42" gauge.

2—Sullivan Longwall mining machines, AC, #2991, #7061.

LOCOMOTIVES

3—Goodman 5 ton locomotives, type W1-2A5, 36" or 42" gauge. One is complete with electric reel.

2—Goodman 6 ton ball bearing locomotives, type 3314T, 36" or 42" gauge.

1—General Electric Co. 8 ton ball bearing locomotive. HM-839A motors. 36" or 42" gauge.

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2—Jeffrey Crushers, single roll, size 30x30.

1—American Pulverizer Company crusher, size 31"x36" Ball Bearing type S. Serial No. 1290, No. 24 driven by AC motor enclosed. Fan ventilated type direct connected to crusher by coupling motor, 30 HP, 600 RPM, 440 volts 3 phase, 60 cycle.

1—American Pulverizer Rolling Ring Crusher No. 24. Serial 1030, size 44x36. This crusher has a sub-base and a flexible coupling. No motor. Crushes from 20" down to ¾".

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1—Ottumwa new type box car loader. Will load coal from tipple into box car.

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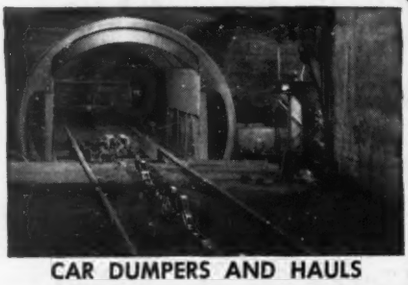

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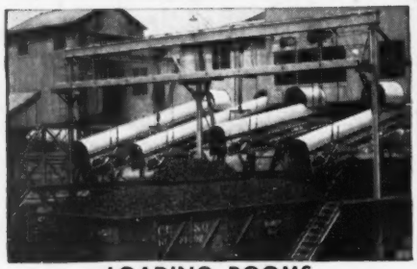

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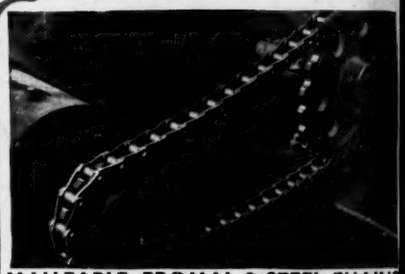

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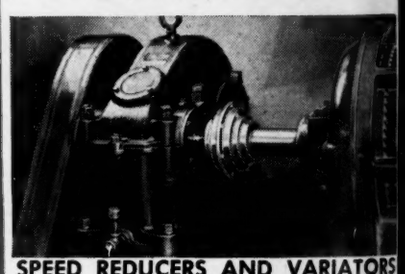

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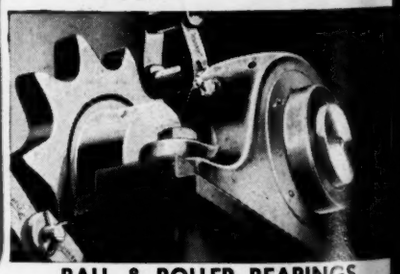

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